ATTACHMENT TO SCIENTIFIC NOTEBOOK #363
WATERSHED MODELING - FUTURE CLIMATE
PROJECT 20-01402-861

DAVID WOOLHISER

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R Fedors 6/6/00

TO: Bruce Mabrito
FROM: R. Fedors
SUBJECT: Attachment to Scientific Notebook #363 - David Woolhiser
DATE: June 6, 2000

Prior to being issued an official bound scientific notebook, David Woolhiser was keeping notes of his work for CNWRA in a 3-ring folder. This volume contains the xeroxed and bound early work by Woolhiser on the future climate study in support of the watershed modeling; the work was continued in the official #363 notebook. The pages have been sequentially numbered and initialed. This volume is treated as a supplement to scientific notebook #363.

WATERSHED MODELING-FUTURE CLIMATE

Project 20-1402-861 Watershed Modeling

ATTACHMENT TO SCIENTIFIC NOTEBOOK 363

David A. Woolhiser, Hydrologic Consultant

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STOCHASTIC WEATHER SIMULATION FOR FUTURE CLIMATE CONDITIONS AT YUCCA MOUNTAIN, NEVADA

PROPOSAL
By
David A. Woolhiser, Ph.D.

BACKGROUND

A thorough evaluation of the suitability of the Yucca Mountain site as a geologic repository for high level nuclear waste requires an estimation of percolation fluxes past the repository horizon under future climate conditions. Sources of water fluxes traversing the unsaturated zone include water that has percolated below the root zone on upland areas and water that has infiltrated into the beds of ephemeral channels within the repository footprint. Two approaches can be used to estimate fluxes under future conditions: 1) Find an analog site that has a climate similar to the expected future climate and also has similar geologic characteristics and make physical measurements of fluxes. 2) Utilize a hydrologic model that describes the appropriate infiltration mechanisms and model the Yucca Mountain conditions under a hypothesized future climate. Because of the strong relationship between precipitation and elevation in southern Nevada, it is possible to find an analog site nearby that has the hypothesized future annual precipitation. However, the seasonal distribution of precipitation may not be as hypothesized. The modeling approach requires the development of a stochastic weather simulator to provide such variables as precipitation, maximum temperature, minimum temperature and solar radiation on at least a daily time step.

The models WGEN (Richardson and Wright, 1984), CLIGEN (Nicks and Gander, 1993,1994) and USCLIMATE (Hanson et al. 1994) are examples of stochastic weather simulation models. The latter two models have been thoroughly compared by Johnson et al. (1996). Shortcomings were identified for both models and recommendations for improvements were made. However Johnson et al. (1996) concluded "...the desired application for a climate simulation model should dictate model choice. For linkage to natural systems modeling, USCLIMATE seems superior in most respects, especially because of its daily parameterization, realistic simulations of variability and preservation of correlation among elements."

Recently some investigators have developed procedures to modify parameters in stochastic weather models, specifically WGEN, to identify climate change sensitivities and impacts (Wilks, 1992; Katz, 1996; Mearns et al., 1996). WGEN uses a monthly parameterization for the precipitation model. This stepwise parameterization was identified as a weakness of CLIGEN by Johnson et al. (1996). Because USCLIMATE utilizes the same algorithms for the generation of daily temperatures and solar radiation as WGEN, yet has daily parameterization by means of Fourier series, it seems worthwhile to investigate methods to adjust parameters in USCLIMATE to create weather sequences for hypothesized future climates.

THE USCLIMATE MODEL

a. *Daily precipitation occurrence*

The precipitation occurrence or nonoccurrence on day n of year τ is represented by the random variable $X_\tau(n)$; $\tau = 1,2,\ldots M$; $n = 1,2,3,\ldots 365$; where:

$$X_\tau(n) = 0 \; if \;\; precipitation\ did\ not\ occur\ on\ day\ n$$
$$X_\tau(n) = 1 \; if \;\; precipitation\ occurred\ on\ day\ n \qquad (1)$$

The dependence between wet and dry occurrences on successive days is modeled as a daily varying first order Markov chain with transition probabilities:

$$P_{ij}(n) = P\{X_\tau(n) = j \mid X_\tau(n-1) = i\};\, n = 2,3,\ldots 365;\, i,j = 0,1$$
$$P_{ij}(n) = P[X_\tau = j \mid X_\tau(365) = i\}\ , n = 1 \qquad (2)$$

Because $P_{i1}(n) = 1 - P_{i0}(n)$; $i = 0,1$, only two parameters are required for each day. To reduce the number of parameters that must be estimated and to insure smooth seasonal variations the daily values of the transition probabilities are described by a finite Fourier series:

$$P_{i0}(n) = \overline{P}_{i0} + \sum_{k=1}^{m_i} c_{ik} \sin(2\,\pi\, k/365 + \Theta_{ik});\quad n = 1, 2, \ldots 365. \qquad (3)$$

where i= 0 or 1, m_i is the maximum number of harmonics required to describe the seasonal variability of the transition probability, $\overline{P}_{i0}$ is the annual mean, c_{ik} is the amplitude, and Θ_{ik} is the phase angle in radians for the kth harmonic. The means, amplitudes and phase angles are estimated by maximum likelihood techniques (Woolhiser and Pegram, 1979; Roldan and Woolhiser, 1982).

The unconditional probability of a wet day can be closely approximated by the expression:

$$P\{X(n) = 1\} = [1 - P_{00}(n)]/[1 + P_{10}(n) - P_{00}(n)] \qquad (4)$$

b. *Distribution of daily precipitation*

A mixed exponential distribution is used to describe the precipitation depth above a threshold, T:

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$$f_n(y') = \frac{\alpha(n)\beta(n)\exp[-y'/\beta(n)]}{\beta(n)} + \frac{[1-\alpha(n)]\exp[-y'/\delta(n)]}{\delta(n)} \quad (5)$$

where y' =y-T; y is the daily precipitation, $\alpha(n)$ is a weighting parameter having values between 0 and 1; $\beta(n)$ and $\delta(n)$ are the means of the smaller and larger exponential distributions respectively. Let $\mu(n)$ be the mean of the mixed exponential distribution, specified by the following:

$$\mu(n) = \alpha(n)\beta(n) + [1-\alpha(n)]\delta(n) \quad (6)$$

The seasonal values of the parameters $\mu(n)$, $\delta(n)$ and $\alpha(n)$ are also described by Fourier series and the means amplitudes and phase angles are obtained by numerical optimization of the log likelihood function as described by Woolhiser et al. (1988). Significant harmonics are determined by the Akaike inornmation criterion (AIC) (Akaike, 1974).

c. Expected precipitation accumulation on day m.

The Markov chain and the distribution of amounts are assumed independent and the precipitation amounts are assumed to be serially independent, so the expected total precipitation for m days can be written as:

$$E\{S(m)\} = \sum_{nn=1}^{m} E\{X(n)Y(n)\} = \sum_{n=1}^{m} E\{X(n)E\{Y(n)\} \quad (7)$$

Where Y(n) is the precipitation amount on day n. Thus the expectation can be written:

$$E\{S(m)\} = \sum_{n=1}^{m} [P\{X(n-1)=0\}P_{01}(n) + P\{X(n-1)=1\}P_{11}(n)][\mu(n)+T] \quad (8)$$

Expected annual precipitation is obtained when m=365. Leap years are not explicitly accounted for in this model although leap days can be included in the simulation mode.

d. Stochastic description of temperature and solar radiation

Daily maximum temperature (t_{max}), minimum temperature (t_{min}) and solar radiation (r) are described by a weakly stationary multivariate generating process based on work by Matalas (1967) and conditioned upon the precipitation occurrence process (Richardson, 1981).

The equation proposed by Richardson is:

$$t_i(n) = \chi_i(n)s_i(n) + \mu_i(n); \quad i = 1,2,3 \quad (9)$$

where $t_1(n)$ is the daily value of t_{max}, $t_2(n)$ is the daily t_{min}, $t_3(n)$ is the daily solar radiation, r, and $s_i(n)$ and $\mu_i(n)$ are the appropriate standard deviation and mean respectively. The quantities, $s_i(n)$ and $\mu_i(n)$ are conditioned upon whether the day was dry or wet and the seasonal variation is described by Fourier series. $\chi_i(n)$ is a vector of residuals obtained from the following expression:

$$\chi_i(n) = A\chi_i(n-1) + B\varepsilon_i(n) \tag{10}$$

where $\chi_i(n)$ is a vector whose elements are the standardized residuals of t_{max}, t_{min} and r; **A** and **B** are 3 by 3 matrices with elements that define the serial and cross-correlation coefficients; and ε_i is a vector of independent, normally distributed random variables with mean 0 and standard deviation of 1. The A and B matrices are:

$$\begin{aligned} A &= M_1 M_0^{-1} \quad and \\ BB^T &= M_0 - M_1 M_0^{-1} M_1^T \end{aligned} \tag{11}$$

where the superscripts –1 and T represent the inverse and transpose respectively. M_0 and M_1 are defined as:

$$M_0 = \begin{vmatrix} 1 & \rho_0(1,2) & \rho_0(1,3) \\ \rho_0(1,2) & 1 & \rho_0(2,3) \\ \rho_0(1,3) & \rho_0(2,3) & 1 \end{vmatrix} \tag{12}$$

$$M_1 = \begin{vmatrix} \rho_1(1) & \rho_1(1,2) & \rho_1(1,3) \\ \rho_1(2,1) & \rho_1(2) & \rho_1(2,3) \\ \rho_1(3,1) & \rho_1(3,2) & \rho_1(3) \end{vmatrix} \tag{13}$$

where $\rho_0(j,k)$ is the correlation coefficient between the variables j and k on the same day $\rho_1(j,k)$ is the correlation coefficient between the variables j and k with the variable k lagged one day and $\rho_1(j)$ is the lag one serial correlation coefficient for variable j. It has been found that the elements in matrices $\mathbf{M_0}$ and $\mathbf{M_1}$ exhibit very little spatial variability within the United States (Richardson, 1982). Average correlation coefficients given by Richardson (1982) and Richardson and Wright (1984) and the A and B matrices derived from them (Equation 11) are used in USCLIMATE (Hanson et al., 1994).

Equation 9 is utilized in the form:

$$t_j(n) = \mu_j(n)[\chi_j(n)c_j(n) + 1] \tag{14}$$

where $c_j(n)$ is the coefficient of variation. The seasonal changes in the means and coefficients of variation are specified by the expression:

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$$u_j(n) = \widehat{\mu}_j + c_j \cos[0.0172(n - D_j)], n = 1,2,\ldots 365 \tag{15}$$

where $u_j(n)$ is the mean or coefficient of variation on day n, $\widehat{\mu}_j$ is the annual mean, $c_j(n)$ is the amplitude of the first harmonic and D_j is the phase angle in days. Richardson and Wright (1984) presented maps of these variables determined from 31 U.S. stations. The maps in USCLIMATE are based upon 20 years of data from at least 40 stations (Hanson et al., 1994).

ADJUSTMENT OF USCLIMATE PARAMETERS FOR A CHANGED CLIMATE

a.) Markov Chain-Mixed Exponential Parameters

Woolhiser (1997) used a somewhat subjective procedure to modify the parameters in the Markov chain-mixed exponential (MCME) model in USCLIMATE to simulate precipitation sequences with a 150mm increase in annual precipitation
Possible future climate scenarios for Yucca Mountain have been proposed (DeWispelare et al., 1993). Although the conclusions by the experts were not consistent, all but one of the panelists predicted an increase in average annual precipitation during the 10,000 year time horizon. The maximum increase predicted was 150 mm greater than the present. (about a 100% increase). This estimate provides a bounding value and was adopted. No guidance was given regarding changes in the seasonal distribution of precipitation given the 150mm increase. The adjustment procedure used by Woolhiser (1997) follows.

An increase in the annual precipitation can result from an increase in the number of wet days or an increase in the mean depth of precipitation per wet day, or both. As an approximation we can write:

$$P + \Delta P = (N + \Delta N)(\mu + \Delta\mu) = N\mu + \mu\Delta N + N\Delta\mu + \Delta\mu\Delta N \tag{16}$$

Where:

P = present average annual precipitation

ΔP = Change in annual Precipitation = 150 mm. = 5.9 inches.

N = Expected present annual number of wet days = 37 (from Markov chain model).

ΔN = change in mean number of wet days.

μ = mean depth of rainfall per wet day. (0.158 inches) (from the mixed exponential model).

$\Delta\mu$ = change in mean depth of rainfall per wet day.

Substituting the above quantities in Equation 16 and simplifying:

$$\Delta P = 0.158\Delta N + 37\Delta\mu + \Delta\mu\Delta N = 5.9 \tag{17}$$

As an approximation, the first two terms on the right hand side of the equation were set equal to 2.4 inches.
Solving we obtain: ΔN = 15.19 days and $\Delta\mu$ = 0.0649 inches.

The first order Markov chain mean annual transition probabilities, P_{00} and P_{10}, were adjusted to achieve an increase of 15.19 wet days. If the transition probabilities were constant, the steady state probability of a wet day is:

$$P_1 = [1 - P_{00}][1 + P_{10} - P_{00}]^{-1} \quad (18)$$

Now by definition:

$$N = 365 P_1 \quad and \quad \Delta N = 365 \Delta P_1 = 15.19 \quad (19)$$

$$\Delta P_1 = \frac{\partial P_1}{\partial P_{00}} \Delta \overline{P}_{00} + \frac{\partial P_1}{\partial P_{10}} \Delta \overline{P}_{10} \quad (20)$$

Solving for ΔP_1 and setting $\Delta P_{00} = \Delta P_{10}$ = -0.0302, we obtain estimates of the average annual transition parameters and the mean depth of rainfall per wet day.

$\Delta\overline{P}_{00}$ = 0.9284 - 0.0302 = 0.8982

$\overline{\Delta P}_{10}$ = 0.6541 - 0.0302 = 0.6239

$\overline{\mu}$ = 0.1576 + 0.0649 = 0.2225

All amplitudes and phase angles for the Fourier series fit to the above parameters remained the same to preserve a similar seasonality. The above changes resulted in an increased frequency of wet days, increased persistence of rainfall and greater mean daily rainfall depths. Such changes are consistent with increased atmospheric instability for all seasons.

Although the above procedure results in simulated sequences of precipitation with an expected annual value 150mm greater than present, it is not clear that the adjustments in the mean annual values of $\overline{P}_{00}$, $\overline{P}_{10}$ and $\overline{\mu}$ are realistic. If one can accept the hypothesis that a future wetter and cooler climate at Yucca Mountain would be similar to the climates presently existing at nearby locations at higher elevations, the relationships developed by Hanson et al. (1989) could be useful. Hanson et al. (1989) utilized data from a network of raingages on the Reynolds Creek Experimental Watershed in southwest Idaho to evaluate the effect of mean annual precipitation on parameters of the MCME model. They used procedures described by Woolhiser and Roldan (1986) to estimate the MCME model parameters for each of the 16 gages on Reynolds

Creek Experimental Watershed. The annual precipitation at these gages ranged from 241 to 1144mm and the mean annual number of wet days ranged from 84 to 133.9. Thus the projected annual precipitation at Yucca Mountain (165+150 = 315mm) is within the range of the Idaho stations.

Hanson et al. (1989) utilized regression techniques to determine the relationships between MCME parameters and mean annual precipitation, X. The following relationships were significant for the Markov chain:

$$\Theta_1 = \ln\left[\bar{P}_{00} / (1 - \bar{P}_{00}\right] = 2.506 - 0.165(\ln X)\,;\, (R^2 = 0.94) \qquad (21)$$

$$\Theta_2 = \ln\left[\bar{P}_{10} / (1 - \bar{P}_{10}\right] = 2.866 - 0.497(\ln X);\, (R^2 = 0.96) \qquad (22)$$

They also found significant relationships between the amplitudes of the first harmonics of P_{00} and P_{10} and mean annual precipitation.

The following relationships were significant for the mixed exponential distribution:

$$\Theta_3 = \ln[\bar{\alpha} / (1 - \bar{\alpha}) = -0.0449 - 0.00115X; \quad (R^2 = 0.74) \qquad (23)$$

$$\bar{\mu} = 1.644 + 0.00531X; \quad (R^2 = 0.99) \qquad (24)$$

They also found that the first phase angle of μ decreased nonlinearly with X and that the amplitude of the first phase angle of μ remained constant for stations with 55mm of annual precipitation or less and then increased linearly.

It would be unrealistic to assume that the above regression equations would provide realistic estimates of the parameters of the MCME model for Yucca Mountain under current or future climates. However, realistic adjustments to existing parameters may be made by utilizing the derivatives of the parameters with respect to annual precipitation in the regression equations.

By differentiating Equations (21), (22), (23) and (24) we obtain:

$$\frac{d\Theta_1}{dX} = -\frac{0.165}{X} \qquad (25)$$

$$\frac{d\Theta_2}{dX} = \frac{-0.497}{X} \qquad (26)$$

$$\frac{d\Theta_3}{dX} = -0.00115 \qquad (27)$$

$$\frac{d\bar{\mu}}{dX} = 0.00531 \tag{28}$$

If we approximate the corrections to each mean parameter by the expression:

$$\Delta U = \frac{dU}{dX}\Delta X \tag{29}$$

where U is the mean of the appropriate function and ΔX is the difference in mean annual precipitation (150mm), we obtain the corrections shown in the following table.

Table 1
Comparison of corrections to MCME mean parameter values

Parameter	Correction by Woolhiser	Correction by Regression
$\Delta\bar{P}_{00}$	-0.0302	-0.0106
$\Delta\bar{P}_{10}$	-0.0302	-0.108
$\Delta\bar{\mu}$	1.65mm	0.77mm
$\Delta\bar{\alpha}$	No correction	0.07

An examination of Table 1 reveals that the arbitrary adjustments by Woolhiser are not consistent with those implied by the regression relationships found by Hanson et al. (1989). The corrections by Hanson et al. (1989) provide for an increased number of wet days by a greater increase in the persistence, a smaller increase in the dry to wet transition probability and also provide a smaller increase in the mean depth per wet day.

b.) Maximum temperature, minimum temperature and solar radiation parameters

Because Woolhiser (1997) was only interested in simulating precipitation, he did not examine the problem of adjusting the parameters in Equations (9) through (15) to reflect a cooler climate. It should be noted that when the MCME model is adjusted to reflect a wetter climate, there will be an automatic adjustment in the temperature and radiation regimes, because t_{max}, t_{min} and r are conditioned on whether the day is wet or dry. For example, in the Yucca Mountain vicinity the mean for t_{max} is about ten degrees F lower on a wet day than on a dry day and the mean solar radiation on a wet day is about 180 Langleys smaller than on a dry day. Because the elements in the matrices (12) and (13) show very little variation over the continental U.S., we should not expect any change for future climate. We should also expect no change in the radiation process (although it could be adjusted to reflect the aspect of specific hillslopes). If the realizations of the t_{max}, and t_{min} processes, given an adjustment in the precipitation process do not result in the hypothesized mean annual temperature, it would be easy to adjust the annual means of t_{max}, and t_{min} to make the required correction.

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PROPOSED PROJECT ON DEVELOPING TECHNIQUES TO ADJUST PARAMETERS OF THE USCLIMATE MODEL TO REFLECT CLIMATE CHANGE

Objective
To develop a stochastic weather model that can simulate sequences of daily precipitation, maximum temperature, minimum temperature and solar radiation for Yucca Mountain under present and future climate conditions.

Procedures and Estimate of Professional Time

1) Obtain a minimum of 30 years of daily precipitation data for nearby weather stations, including Las Vegas, Beatty and a station with about 165mm of annual precipitation. (3 hrs)
2) Utilize the Fortran programs MCLOGIT to estimate the MCME parameters for those stations. The MCLOGIT program utilizes the logit transform of the Markov chain transition probabilities and results in a much better fit to monthly statistics for arid regions than the algorithms used by Hanson et al. (1994). (6 hrs)
3) Adjust the parameters obtained above to match the current annual precipitation at Yucca Mountain, using the regressions of Hanson et al. (1989). (6 hrs)
4) Compare precipitation statistics generated with this model to those used in the Solitario Canyon simulations and summarize the implications for the channel infiltration study. (8 hrs)
5) Utilize the regression relationships of Hanson et al.(1989) to adjust parameters in the MCME model for a wetter future climate and develop procedures to adjust the amplitudes and phase angles of significant harmonics to change the seasonality (i.e. a relative increase in winter precipitation. One possibility would be to postulate the expected annual accumulation of precipitation in a future climate (see Equation 8) and then to minimize a sum of squares objective function by adjusting amplitudes and phase angles of the Fourier series for the transition probabilities. (24 hrs)
6) Generate sequences of t_{max}, t_{min} and r and adjust mean temperature parameters to match the hypothesized mean annual temperature. (16 hrs)

7.) Write a technical paper describing the development of procedures to adjust parameters of a stochastic weather for future climates. (40 hrs.)

DELIVERABLES

1.) A stochastic weather generator to provide daily sequences that can be used as input to water balance models for modeling the runoff and infiltration regime at Yucca Mountain under present and future climate conditions.

2.) A technical paper describing the techniques developed to adjust weather generator parameters for future climates.

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Nevada Station Data Inventory

NOAA/NWS cooperative observer network

From NCDC Station Historical Listing for NWS Cooperative Network
ObsTyp: t-Temperature-1, p-Daily precip-2, w-(blank), s-(blank), e-Evap-5
h-Hourly precip - 6 0.01" Universal, or - 7 0.10" Fisher-Porter
U - Observed, but beginning date is uncertain

Count	Number (Coop)	Station Name (From NCDC listing)	Lat ddmm	Long dddmm	Elev ftx10	Start yy mm	ObsTyp tpwseh	End yy mm
1	-							
2	-							
3	260012-2	ACHURRA RANCH	4026	11535	0651	52 11		54 05
4	260012-2	ACHURRA RANCH	4026	11535	0614	54 05		56 07
5	260015-3	ACOMA	3731	11410	0553	49 12		58 12
6	260035-3	ADAMS RANCH	3618	11544	0871	66 07		76 07
7	260046-3	ADAVEN	3807	11535	0625	48 07	UU	80 06
8	260046-3	ADAVEN	3807	11535	0625	80 12	UU	82 04
9	260099-4	ALAMO	3722	11109	-999	48 07	UU U	54 11
10	260099-4	ALAMO	3722	11510	-999	54 11	UU U	64 02
11	260109-4	ALAMO MNTC STN	3722	11509	0410	48 07		49 08
12	260150-4	AMARGOSA RANCH	3632	11630	0237	65 11		70 10
13	260150-4	AMARGOSA FARMS GAREY	3634	11628	0245	78 03	UU	86 03
14	260150-4	AMARGOSA FARMS GAREY	3634	11628	0245	86 03	12	99 99
15	260191-6	AMERICAN BEAUTY	4031	11526	0801	58 10		69 09
16	260232-2	ANGEL LAKE	4102	11506	0833	00 00		76 07
17	260282-2	ANTELOPE VALLEY FARR	3957	11725	0490	84 07	12	99 99
18	260438-2	ARTHUR 5 NW	4048	11511	0640	48 07	UU	61 12
19	260438-2	ARTHUR 5 NW	4047	11511	0628	63 07	UU	76 09
20	260438-2	ARTHUR 5 NW	4047	11511	0631	76 09	UU	86 06
21	260438-2	ARTHUR 4 NW	4047	11511	0630	86 06	12	99 99
22	260480-3	ATLANTA MINE	3827	11420	0680	81 04	UU	85 09
23	260507-2	AUSTIN	3930	11705	0661	48 07	UU U	48 12
24	260507-2	AUSTIN	3930	11705	0655	49 02	UU U	57 12
25	260507-2	AUSTIN	3930	11705	0660	58 01	UU U	59 12
26	260507-2	AUSTIN	3930	11705	0660	60 01	UU U	65 12
27	260507-2	AUSTIN	3930	11705	0660	66 01	UU U	99 99
28	260645-3	BARCLAY CROSSING	3731	11416	0551	49 12		74 03
29	260668-3	BASALT	3800	11816	0636	48 07		59 06
30	260688-W	BATTLE MOUNTAIN	4039	11656	0451	31 01		45 12
31	260691-2	BATTLE MOUNTAIN FAA AIR	4037	11652	0453	48 07	UU U	48 12
32	260691-2	BATTLE MOUNTAIN FAA AIR	4037	11652	0453	49 01	UU U	62 12
33	260691-2	BATTLE MOUNTAIN 2	4038	11656	0452	63 01		64 10
34	260691-2	BATTLE MOUNTAIN AIRPORT	4035	11654	0454	81 07	UU U	86 04
35	260691-2	BATTLE MOUNTAIN AIRPORT	4035	11654	0454	86 04	12 U	87 11
36	260691-2	BATTLE MOUNTAIN AIRPORT	4037	11652	0453	87 11	12 U	89 03
37	260691-2	BATTLE MOUNTAIN 4 SE	4037	11653	0454	89 05	12 7	99 99
38	260714-4	BEATTY	3654	11645	0331	48 07	UU U	57 01
39	260714-4	BEATTY	3654	11645	0330	57 01	UU U	58 11
40	260714-4	BEATTY	3655	11645	0330	58 11	UU U	72 11
41	260718-4	BEATTY 8 N	3700	11643	0355	72 11	UU U	84 09
42	260718-4	BEATTY 8 N	3700	11643	0355	84 10	12 7	99 99
43	260795-2	BEOWAWE	4036	11629	0470	49 07	UU	87 05
44	260795-2	BEOWAWE	4036	11629	0470	87 05	U2	87 11
45	260795-2	BEOWAWE	4036	11629	0470	87 11	12	99 99
46	260800-2	BEOWAWE GUND RANCH	3954	11635	0575	72 06	UU U	87 12

47	260800-2	BEOWAWE U OF N RANCH	3954	11635	0574	87	12	12	5	99	99
48	260805-3	BERLIN STATE PARK	3852	11735	0694	85	07	12		88	04
49	260805-3	BERLIN STATE PARK	3852	11735	0693	88	04	12		88	04
50	260820-2	BIG BEND	4146	11541	0671	63	09			76	09
51	260840-1	BILK CREEK	4150	11825	0700	65	11			UN	KN
52	260955-3	BLUE EAGLE RANCH HANKS	3832	11533	0478	78	03	UU		85	08
53	260955-3	BLUE EAGLE RANCH HANKS	3832	11533	0478	85	08	12		86	01
54	260955-3	BLUE EAGLE RANCH HANKS	3832	11533	0478	86	01	12	7	99	99
55	260961-3	BLUE JAY HIGHWAY STN	3823	11613	0532	63	05	UU	U	85	04
56	260990-1	BLUE LAKE	4139	11843	0801	62	07			74	10
57	261071-4	BOULDER CITY	3559	11451	0252	48	07	UU	U	85	10
58	261071-4	BOULDER CITY	3559	11451	0252	85	10	12	5	99	99
59	261076-4	BOULDER CITY AIRPORT	3559	11450	-999	36	08			37	12
60	261076-4	BOULDER CITY AIRPORT	3559	11450	-999	38	04			37	12
61	261076-4	BOULDER CITY AIRPORT	3558	11450	-999	50	02			UN	KN
62	261160-1	BRINKERHOFF RANCH	4005	11740	0366	66	06	UU		81	10
63	261308-1	BUCKSKIN MOUNTAIN	4147	11733	0781	48	07			67	08
64	261311-1	BUFFALO CREEK RANCH	4023	11728	0543	66	06	UU		82	02
65	261317-2	BULL CREEK RANCH	3903	11537	0591	63	07	UU		66	09
66	261320-3	BUNKER PEAK	3727	11407	0558	49	12			76	09
67	261324-4	BUNKERVILLE	3646	11408	0154	52	03			53	11
68	261327-4	BUNKERVILLE 2 SW	3645	11409	0152	79	11	UU		83	03
69	261327-4	BUNKERVILLE	3646	11407	0155	83	03	12		99	99
70	261330-4	BUNKERVILLE MOUNTAIN	3637	11412	0325	66	07			76	07
71	261348-1	CABIN CREEK	4143	11730	0611	59	12			74	10
72	261355-4	LITTLE RED ROCK	3609	11525	0380	72	04	UU		73	07
73	261358-3	CALIENTE	3737	11431	0440	48	07	UU		84	12
74	261358-3	CALIENTE	3737	11431	0440	84	12	12		99	99
75	261371-4	CALLVILLE BAY	3609	11444	0127	89	07	12		99	99
76	261400-1	CANYON CREEK	4144	11735	0700	62	07			74	10
77	261415-2	CARLIN GOLD MINE	4058	11619	0653	66	10	UU		69	03
78	261415-2	CARLIN GOLD MINE	4058	11619	0654	69	03	UU		71	06
79	261415-2	CARLIN GOLD MINE	4058	11619	0653	71	06	UU		86	03
80	261415-2	CARLIN GOLD MINE	4058	11619	0653	86	03	12		88	03
81	261415-2	CARLIN GOLD MINE	4058	11619	0652	88	03	12		89	08
82	261415-2	CARLIN NEWMONT MINE	4058	11619	0652	89	08	12		99	99
83	261443-4	CARP	3707	11430	0300	49	05			51	09
84	261443-4	CARP	3707	11430	0260	51	09			62	11
85	261485-1	CARSON CITY	3909	11946	0465	48	07	UU		84	05
86	261485-1	CARSON CITY	3909	11946	0465	84	05	12		99	99
87	261630-2	CENTRAL NEVADA FIELD LA	3923	11719	0596	65	10	UU	U	86	11
88	261660-2	CHARLESTON	4139	11531	0600	61	07	UU		71	01
89	261680-2	CHARNAC BASIN	3919	11627	0851	54	11			76	07
90	261684-2	CHERRY CREEK	3955	11453	0613	66	12	UU	U	68	08
91	261692-1	CHICKEN CREEK	4136	11842	0640	61	01			74	10
92	261718-W	CLAY CITY	3626	11624	0219	31	01			37	12
93	261725-1	CLEAR CREEK CANYON	4044	11737	0511	59	09			74	10
94	261740-W	CLOVER VALLEY	4044	11502	0580	31	01	UU		41	12
95	261740-2	CLOVER VALLEY	4052	11502	0575	65	09	UU		86	06
96	261740-2	CLOVER VALLEY	4052	11502	0575	86	06	12		99	99
97	261755-3	COALDALE	3803	11754	0465	48	07	UU		53	05
98	261755-3	COALDALE	3802	11753	0464	53	05	UU		55	05
99	261755-3	COALDALE	3802	11753	0465	55	05	UU		58	11
100	261755-3	COALDALE	3803	11754	0460	63	07	UU		65	01
101	261790-3	COLD CREEK RANCH	3625	11544	0611	48	07			76	07
102	261889-2	CONNORS PASS	3902	11439	0733	53	10			76	07
103	261905-2	CONTACT	4147	11445	0537	48	07	UU	U	87	10
104	261905-2	CONTACT	4147	11446	0545	87	10	12	U	87	12
105	261905-2	CONTACT	4147	11445	0536	88	03	12	7	99	99
106	261925-2	COON CREEK SUMMIT	4148	11529	0831	48	11			76	07
107	261975-2	CORTEZ GOLD MINE	4011	11638	0491	68	09	UU		80	05
108	262020-2	COTTONWOOD RANCH	4006	11721	0540	48	07			49	08
109	262025-1	COW CREEK	4037	11847	0591	67	03			76	05
110	262035-3	CRESTLINE	3740	11408	0580	49	11			76	10

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111	262078-3	CURRANT	3845	11528	0518	48 07			53 11
112	262086-3	CURRANT CREEK SUMMIT	3849	11517	0682	53 10			76 07
113	262091-3	CURRANT HWY STN	3848	11521	0624	63 04	UU		78 03
114	262096-2	CURRIE HIGHWAY STN	4016	11443	0582	61 11	UU		74 08
115	262096-2	CURRIE HIGHWAY STN	4016	11445	0582	85 04	12		99 99
116	262119-1	DAGGET PASS	3859	11953	0733	88 11	12		99 99
117	262189-2	DEETH 2 SW	4104	11517	0534	51 11	UU		65 07
118	262189-2	DEETH 2 SW	4104	11516	0535	65 08	UU		66 11
119	262189-2	DEETH 2 SW	4104	11516	0534	66 11	UU		86 06
120	262189-2	DEETH 2 SW	4104	11516	0534	86 06	12		99 99
121	262229-1	DENIO JUNCTION	4159	11838	0419	51 10	UU		67 10
122	262229-1	DENIO JUNCTION	4158	11838	0419	67 11	UU		86 05
123	262229-1	DENIO JUNCTION	4158	11838	0419	86 05	12		99 99
124	262243-4	DESERT GAME RANGE	3626	11522	0292	48 07	UU		86 03
125	262243-4	DESERT GAME RANGE	3626	11522	0292	86 03	12		99 99
126	262251-4	DESERT ROCK WSMO	3637	11601	0330	84 04	12		99 99
127	262276-3	DIABLO	3755	11603	0511	59 08	UU		79 05
128	262296-2	DIAMOND VALLEY DUBOSE	3941	11556	0591	71 08	UU		72 03
129	262296-2	DIAMOND VALLEY DUBOSE	3941	11556	0597	79 07	UU		86 08
130	262296-2	DIAMOND VALLEY DUBOSE	3941	11556	0597	86 08	12		90 06
131	262296-2	DIAMOND VALLEY USDA	3941	11602	0597	90 06	12		99 99
132	262301-2	DIAMOND VALLEY	3942	11601	0585	63 04			64 11
133	262301-2	DIAMOND VALLEY	3941	11603	0591	64 12			66 02
134	262301-2	DIAMOND VALLEY POLLARD	3947	11555	0586	66 02	UU		68 06
135	262301-2	DIAMOND VALLEY POLLARD	3948	11555	0584	68 06	UU		68 09
136	262301-2	DIAMOND VALLEY POLLARD	3948	11556	0591	68 09	UU		71 08
137	262306-1	DISASTER PEAK	4157	11811	0700	61 01			74 10
138	262311-1	DIXIE VALLEY	4005	11740	0366	65 05	UU		66 04
139	262315-1	DIXIE VALLEY STARK	3943	11811	0354	71 10	UU		77 10
140	262315-1	DIXIE VALLEY STARK	3941	11806	0350	77 10	UU		79 04
141	262315-1	DIXIE VALLEY STARK	3943	11811	0354	79 04	UU		80 12
142	262318-1	DIXIE VALLEY BOYER	3957	11752	0360	81 12	UU		83 03
143	262332-2	DOBY SUMMIT	4054	11552	0660	53 09			76 07
144	262350-2	DOLLY VARDEN	4020	11431	0660	81 11	UU	U	82 03
145	262350-2	DOLLY VARDEN	4020	11431	0660	82 03	12	U	83 01
146	262350-2	DOLLY VARDEN	4020	11431	0661	83 01	12	U	85 01
147	262375-3	DONOHUE RANCH	3817	11416	0683	64 01			76 10
148	262380-2	DORSEY BASIN	4053	11513	0811	63 08	U		76 09
149	262390-3	DUCKWATER	3854	11543	0540	66 09	UU		86 07
150	262390-3	DUCKWATER	3854	11543	0540	86 07	12		88 09
151	262390-3	DUCKWATER	3857	11543	0561	88 09	12		99 99
152	262394-1	VIRGIN VALLEY	4152	11901	0480	59 08	UU		83 07
153	262394-1	VIRGIN VALLEY	4152	11901	0480	83 07	12		99 99
154	262406-1	DUN GLEN	4045	11753	0591	59 09			74 10
155	262416-1	DUTCH FLAT MINE	4110	11730	0480	59 10			74 10
156	262431-3	DYER	3743	11805	0495	48 07			51 12
157	262431-3	DYER	3740	11804	0495	51 12			53 05
158	262431-3	DYER 4 SE	3737	11801	0498	53 05	UU		85 05
159	262431-3	DYER 4 SE	3737	11801	0498	85 05	1U		86 11
160	262431-3	DYER 4 SE	3737	11802	0498	86 11	12		88 10
161	262431-3	DYER	3741	11805	0490	88 10	12		99 99
162	262436-3	EAGLE VALLEY STATE PARK	3802	11411	0596	73 08	UU		74 08
163	262477-1	EASTGATE	3918	11753	0502	48 07			69 07
164	262497-4	ECHO BAY	3619	11424	0125	89 07	12		99 99
165	262557-4	ELGIN	3721	11432	0339	51 03			68 05
166	262557-4	ELGIN	3721	11433	0342	85 07	12	7	99 99
167	262562-4	ELGIN 3 SE	3719	11430	0330	65 04	UU	U	85 07
168	262573-2	ELKO WB AIRPORT	4050	11547	0508	48 01	UU	U	63 12
169	262573-2	ELKO WB AIRPORT	4050	11547	0505	64 01	UU	U	64 12
170	262573-2	ELKO WB AIRPORT	4050	11547	0509	65 01	UU	U	66 12
171	262573-2	ELKO WB AIRPORT	4050	11547	0505	67 01	UU	U	99 99
172	262631-2	ELY WBO	3917	11451	0626	48 01	UU	U	61 12
173	262631-2	ELY WBO	3917	11451	0625	62 01	UU	U	99 99
174	262656-2	EMIGRANT PASS HWY STN	4039	11618	0576	54 08	UU		86 06

175	262656-2	EMIGRANT PASS HWY STN	4039	11618	0576	86	06	12		99	99
176	262662-1	GERLACH	4035	11920	0398	00	00	UU		57	10
177	262662-1	GERLACH	4035	11921	0395	73	09	UU		78	02
178	262708-2	EUREKA	3931	11558	0655	52	09	UU		85	09
179	262708-2	EUREKA	3931	11558	0654	85	09	12		99	99
180	262770-1	FALLON CAA AIRPORT	3925	11843	0394	48	11			55	01
181	262780-1	FALLON EXPERIMENT STN	3927	11847	0397	48	07	UU	U	84	06
182	262780-1	FALLON EXPERIMENT STN	3927	11847	0397	84	06	12	U	99	99
183	262820-2	FERGUSON SPRINGS HMS	4025	11411	0584	72	09	UU	U	82	11
184	262820-2	FERGUSON SPRINGS HMS	4025	11411	0584	82	11	12	U	83	02
185	262840-1	FERNLEY	3936	11915	0420	49	06	UU	U	52	04
186	262840-1	FERNLEY	3937	11915	0416	54	06	UU	U	74	08
187	262849-1	FERNLEY MNTC STN	3937	11916	0416	48	07			54	07
188	262860-2	FISH CREEK RANCH	3916	11600	0605	48	07	UU	U	66	09
189	262903-1	FLEISH POWER HOUSE	3929	11959	0500	58	12			59	09
190	262948-3	GABBS	3852	11755	0463	79	05	UU		85	01
191	262984-1	GARDNERVILLE E FK CSN	3851	11942	0499	67	07			99	99
192	263090-1	GERLACH	4035	11924	0398	48	07			51	01
193	263090-1	GERLACH	4039	11921	0394	62	06	UU		72	01
194	263090-1	GERLACH	4039	11921	0395	72	01	UU		73	09
195	263090-1	GERLACH GREEN	4039	11921	0395	85	08	12		85	10
196	263090-1	GERLACH	4039	11921	0395	85	11	12		99	99
197	263095-1	GETCHELL MINE	4113	11715	0580	59	12			74	03
198	263101-3	GEYSER	3838	11438	0598	48	07	UU		60	08
199	263101-3	GEYSER RANCH	3840	11438	0602	60	08	UU		81	01
200	263101-3	GEYSER RANCH	3840	11438	0602	85	11	12		88	02
201	263114-2	GIBBS RANCH	4133	11513	0600	52	11	UU		86	06
202	263114-2	GIBBS RANCH	4133	11513	0600	86	06	12		99	99
203	263205-1	GLENBROOK	3905	11956	0640	48	07	UU		72	04
204	263205-1	GLENBROOK	3905	11956	0642	72	04	UU		75	08
205	263205-1	GLENBROOK	3905	11957	0636	75	08	UU		99	99
206	263245-1	GOLCONDA	4057	11729	0439	48	07	UU		86	04
207	263245-1	GOLCONDA	4057	11729	0439	86	04	12		99	99
208	263250-1	GOLCONDA TIPTON RANCH	4045	11730	0465	78	08	UU		83	01
209	263285-3	GOLDFIELD	3743	11713	0571	48	07	UU		50	10
210	263285-3	GOLDFIELD	3742	11714	0569	50	10	UU		84	09
211	263285-3	GOLDFIELD	3742	11714	0569	85	04	12		99	99
212	263303-2	GONCE CREEK	4118	11555	0637	48	11			61	08
213	263340-2	GREAT BASIN NATL PARK	3900	11413	0683	87	04	12		88	11
214	263340-2	GREAT BASIN NATL PARK	3900	11413	0683	88	11	12	7	99	99
215	263358-2	GREEN MOUNTAIN	4022	11531	0801	63	08			76	09
216	263450-2	HANKS CREEK	4127	11523	0671	48	11			76	07
217	263465-1	HARDSCRABBLE	4131	11722	0551	59	09			74	03
218	263498-2	HARRISON PASS	4020	11531	0731	48	07			76	10
219	263512-3	HAWTHORNE	3831	11838	0433	54	08	UU		55	08
220	263512-3	HAWTHORNE	3832	11838	0433	61	07	UU		64	11
221	263515-3	HAWTHORNE BABBITT	3832	11839	0418	48	07	UU	U	54	08
222	263515-3	HAWTHORNE BABBITT	3833	11840	0413	57	06	UU	U	74	08
223	263515-3	HAWTHORNE BABBITT	3833	11840	0417	74	08	UU	U	80	10
224	263515-3	HAWTHORNE AIRPORT	3833	11840	0422	80	10	UU	U	90	11
225	263515-3	HAWTHORNE AIRPORT	3833	11840	0422	90	11	12	7	99	99
226	263653-3	HIDDEN FOREST CAMP	3638	11512	0756	48	07			76	10
227	263671-3	HIKO	3733	11513	0394	89	07	12		99	99
228	263724-1	HINKEY SUMMIT	4140	11733	0825	52	10			72	02
229	263816-1	HUALAPAI VALLEY FITTS	4054	11918	0413	69	02	UU		71	03
230	263853-W	HUMBOLDT FIELD	4005	11809	0416	32	01			47	12
231	263940-2	I-L RANCH	4134	11624	0520	62	07	UU		70	10
232	263957-1	IMLAY	4040	11809	0421	48	07			68	05
233	263957-1	IMLAY	4039	11809	0426	68	05	12		99	99
234	263980-4	INDIAN SPRINGS	3635	11541	0312	48	07			64	11
235	263989-3	IONE 11 SE	3851	11729	0700	52	09			76	07
236	264016-2	JACKPOT	4159	11450	0529	86	03	12		99	99
237	264026-2	JACKS CREEK PASS	4133	11600	0774	48	07			76	10
238	264030-1	JACKSON CREEK	4118	11828	0620	65	10			74	10

239	264038-2	JARBIDGE	4152	11526	0616	48	07			61	10
240	264038-2	JARBRIDGE 4 N	4156	11526	0617	90	08	12		99	99
241	264086-2	JIGGS	4025	11540	0520	48	07			52	08
242	264086-2	JIGGS	4026	11540	0545	52	08	UU	U	63	08
243	264086-2	JIGGS	4025	11540	0547	63	08			70	09
244	264086-2	JIGGS	4027	11539	0542	70	09	UU	U	72	03
245	264090-2	JIGGS 13 N	4036	11542	0540	72	03	UU	U	75	10
246	264095-2	JIGGS 3 ENE ZAGA	4028	11537	0576	78	09	UU	U	85	06
247	264095-2	JIGGS 3 ENE ZAGA	4028	11537	0576	85	06	1U	U	87	05
248	264095-2	JIGGS 8 SSE ZAGA	4021	11537	0580	87	05	12	U	89	03
249	264095-2	JIGGS 8 SSE ZAGA	4021	11537	0580	89	03	12		99	99
250	264108-1	JUNGO MEYER RANCH	4054	11826	0420	68	10	UU		69	07
251	264108-1	JUNGO MEYER RANCH	4053	11826	0420	69	07	UU		86	05
252	264128-1	KELLY CREEK RANCH	4116	11706	0511	59	09			74	03
253	264143-3	KEY PITTMAN WMA	3737	11513	0395	64	03	UU		86	07
254	264143-3	KEY PITTMAN WMA	3737	11513	0395	86	07	1U		88	05
255	264143-3	KEY PITTMAN WMA	3737	11513	0395	88	05	12		89	07
256	264199-2	KIMBERLY	3916	11502	0723	48	07			58	06
257	264226-1	KINGS RIVER CANYON	4158	11818	0580	60	12			74	10
258	264236-1	KINGS RIVER VALLEY	4146	11813	0424	56	10	UU		68	06
259	264236-1	KINGS RIVER VALLEY	4145	11814	0424	68	06	UU		85	05
260	264236-1	KINGS RIVER VALLEY	4145	11814	0424	85	05	1U		87	11
261	264236-1	KINGS RIVER VALLEY	4145	11814	0423	87	11	12		99	99
262	264255-2	KINGSTON CANYON	3912	11706	0676	55	10			76	07
263	264259-2	KINGSTON SUMMIT	3918	11707	0851	55	10			76	07
264	264268-2	KNOLL CREEK FIELD STN	4138	11444	0600	71	11	UU		79	12
265	264314-3	KYLE CANYON RANGER STN	3616	11538	0718	48	07			49	01
266	264314-3	KYLE CANYON RANGER STN	3615	11536	0721	57	10			76	07
267	264341-2	LAGES	4003	11437	0596	83	11	12		85	04
268	264341-2	LAGES	4003	11437	0596	85	04	12	7	99	99
269	264349-1	LAHONTAN	3928	11904	0416	48	07	UU		78	04
270	264349-1	LAHONTAN	3928	11904	0415	78	04	UU		88	03
271	264349-1	LAHONTAN	3928	11904	0415	88	03	12		99	99
272	264369-1	LAKE MEAD EVAPORATION	3601	11449	0172	69	03	UU	U	76	12
273	264379-3	LAKE VALLEY	3822	11437	0598	66	08	UU		72	01
274	264384-3	LAKE VALLEY STEWARD	3819	11439	0636	70	11	UU		85	08
275	264384-3	LAKE VALLEY STEWARD	3819	11439	0635	85	08	UU		89	04
276	264384-3	LAKE VALLEY STEWARD	3819	11439	0635	89	04	12		99	99
277	264390-2	LAMOILLE CANYON	4038	11521	0851	67	08			76	07
278	264392-2	LAMOILLE 3 E	4044	11526	0631	72	10	UU		75	09
279	264394-2	LAMOILLE MILLER RANCH	4042	11533	0580	75	10	UU		82	02
280	264394-2	LAMOILLE MILLER	4045	11540	0575	82	02	12		83	05
281	264394-2	LAMOILLE YOST	4043	11531	0584	83	05	12		89	08
282	264394-2	LAMOILLE YOST	4043	11531	0584	89	08	12	7	99	99
283	264395-2	LAMOILLE PH	4041	11528	0629	48	07	UU		72	07
284	264429-4	LAS VEGAS	3610	11508	0201	48	07			56	12
285	264434-4	LAS VEGAS WB AIRPORT	3614	11502	0188	48	01			49	01
286	264436-4	LAS VEGAS WSO AIRPORT	3605	11510	0217	49	01	UU	U	75	12
287	264436-4	LAS VEGAS WSO AIRPORT	3605	11510	0216	76	01	UU	U	99	99
288	264457-4	LATHROP WELLS	3638	11624	0266	48	07			52	03
289	264457-4	LATHROP WELLS	3639	11623	0267	52	03			54	07
290	264457-4	LATHROP WELLS	3639	11624	0267	54	07			64	02
291	264473-4	LATHROP WELLS 16 SSE	3625	11621	0218	70	11	UU		78	03
292	264480-4	LAUGHLIN	3510	11437	0068	83	10			87	12
293	264480-4	LAUGHLIN	3510	11437	0068	87	12	12		99	99
294	264491-2	LEE	4034	11537	0600	99	10			47	06
295	264500-3	LEE CANYON	3618	11541	0921	54	10			76	07
296	264502-3	LEE CANYON SUMMIT	3618	11541	0901	48	07			54	10
297	264514-2	LEHMAN CAVES NM	3900	11413	0683	48	07	UU		84	09
298	264514-2	LEHMAN CAVES NM	3900	11413	0683	84	09	12		87	04
299	264527-1	LEONARD CREEK RANCH	4131	11843	0423	54	12	UU	U	81	07
300	264527-1	LEONARD CREEK RANCH	4131	11843	0422	81	07	UU	U	88	07
301	264527-1	LEONARD CREEK RANCH	4131	11843	0422	88	07	12	U	99	99
302	264542-W	LEWERS RANCH	3914	11951	0520	31	01			44	12

303	264585-1	LIMERICK PASS	4019	11810	0620	59	11			76	07
304	264600-4	LITTLE RED ROCK	3609	11525	0380	65	02	UU		71	10
305	264618-1	LITTLE VALLEY	3915	11952	0631	54	11			76	07
306	264646-W	LOGANDALE	3636	11429	0140	31	01			38	12
307	264651-4	LOGANDALE UN EXPERIMENT	3634	11428	0132	68	01	UU	U	85	02
308	264651-4	LOGANDALE UN EXPERIMENT	3634	11428	0132	85	02	1U	U	88	03
309	264651-4	LOGANDALE	3637	11429	0141	88	09	12		88	12
310	264651-4	LOGANDALE	3637	11429	0141	88	12	12	7	89	08
311	264651-4	LOGANDALE	3637	11429	0141	89	08	12	57	99	99
312	264675-3	LOVELL SUMMIT	3613	11536	0831	45	07			47	07
313	264698-1	LOVELOCK	4011	11828	0398	48	07	UU	U	82	01
314	264698-1	LOVELOCK	4011	11828	0397	82	01	UU	U	82	07
315	264698-1	LOVELOCK	4011	11828	0397	82	07	12	U	99	99
316	264700-1	LOVELOCK DERBY FIELD	4004	11833	0390	48	07	UU		50	12
317	264700-1	LOVELOCK DERBY FIELD	4004	11833	0393	51	01	UU		55	12
318	264700-1	LOVELOCK DERBY FIELD	4004	11833	0390	56	01	UU		81	12
319	264700-1	LOVELOCK FAA AIRPORT	4004	11833	0390	81	12	UU		82	02
320	264700-1	LOVELOCK FAA AIRPORT	4004	11833	0390	82	02	12		84	09
321	264700-1	LOVELOCK FAA AIRPORT	4004	11833	0390	88	03	12		99	99
322	264715-1	LOVELY VALLEY	4150	11825	0700	65	10			74	10
323	264721-2	LOWER ROBINSON	3925	11505	0757	66	10			74	03
324	264725-2	LOWER TROUT CREEK	4105	11502	0691	63	08			76	09
325	264745-2	LUND	3851	11500	0555	57	08	UU		65	11
326	264745-2	LUND	3851	11500	0557	65	11	UU		86	07
327	264745-2	LUND	3851	11500	0557	86	07	12		99	99
328	264789-2	MAJOR'S PLACE	3901	11437	0650	88	05	12		88	08
329	264804-1	MAJUBA MOUNTAIN	4041	11832	0600	63	10			74	03
330	264824-2	MALA VISTA RANCH	4119	11515	0559	48	07	UU		68	05
331	264835-3	MANHATTAN POWER HOUSE	3832	11705	0696	48	07			50	06
332	264835-3	MANHATTAN POWER HOUSE	3832	11705	0692	50	06			53	05
333	264852-3	MARK TWAIN CAMP	3811	11845	0723	50	06			56	11
334	264858-1	MARLETTE LAKE	3910	11955	0801	48	07			53	11
335	264859-1	MARLETTE LAKE 2	3909	11953	0801	54	11			76	07
336	264888-3	MATHEWS RANCH	3730	11413	-999	49	03			49	07
337	264920-1	MC CLEARYS LITTLE HMR	4129	11701	0480	59	09			74	10
338	264925-N	MCCULLOUGH PASS	3544	11510	0376	65	07			66	10
339	264925-4	MCCULLOUGH PASS	3544	11510	0376	66	10			76	07
340	264935-1	MC DERMITT	4200	11743	0443	50	03	UU	U	70	10
341	264935-1	MC DERMITT 5 W	4200	11748	0450	70	10			71	02
342	264935-1	MC DERMITT	4157	11741	0450	71	02	UU	U	77	04
343	264935-1	MC DERMITT	4200	11743	0453	77	04	UU	U	85	04
344	264935-1	MC DERMITT	4158	11748	0454	85	04	12	7	86	01
345	264935-1	MC DERMITT	4200	11743	0453	86	01	12	7	99	99
346	264939-1	MC DERMITT INDIAN RESER	4158	11738	0511	48	07			50	03
347	264950-2	MC GILL	3924	11446	0635	48	07	UU		85	09
348	264950-2	MC GILL	3924	11446	0630	85	09	12		99	99
349	265078-2	MENDIVE RANCH	4141	11545	0625	55	10			60	02
350	265085-4	MESQUITE	3648	11405	0160	42	01	UU		47	12
351	265085-4	MESQUITE	3648	11404	0157	56	03	UU		58	09
352	265085-4	MESQUITE	3648	11405	0157	58	09	UU		62	03
353	265085-4	MESQUITE	3648	11404	0157	62	03	UU		66	05
354	265092-2	METROPOLIS	4117	11501	0580	65	07	UU	U	85	06
355	265092-2	METROPOLIS	4117	11501	0580	85	06	1U	U	99	99
356	265105-2	MIDAS 4 SE	4112	11644	0520	52	11	UU		72	03
357	265120-2	MIDAS SNOW COURSE	4116	11650	0721	63	11			76	09
358	265132-1	MIDDLEGATE LOWERY	3917	11801	0460	88	04	12		99	99
359	265168-3	MINA	3823	11806	0455	48	07	UU		86	04
360	265168-3	MINA	3823	11806	0455	86	04	12		99	99
361	265191-1	MINDEN	3857	11946	0472	48	07			81	06
362	265191-1	MINDEN AIRPORT	3900	11945	0471	81	06	UU	U	83	01
363	265191-1	MINDEN AIRPORT	3900	11945	0471	83	01	12	U	84	10
364	265191-1	MINDEN	3900	11945	0471	84	10	12	U	90	07
365	265191-1	MINDEN	3858	11946	0471	90	07	12	7	99	99
366	265239-3	MINTO	3735	11422	0473	49	12			51	02

367	265352-2	MONTELLO	4116	11412	0488	48	07	UU			86	09
368	265352-2	MONTELLO 1 SE	4115	11412	0490	86	09	12			99	99
369	265362-3	MOUNT MONTGOMERY	3758	11819	0711	60	06			U	80	11
370	265362-3	MONTGOMERY MNTC STN	3758	11819	0710	80	11			U	84	08
371	265392-2	MOUNTAIN CITY RANGER ST	4147	11557	0562	55	02				80	10
372	265392-2	MOUNTAIN CITY R S	4150	11558	0564	80	10	UU			99	99
373	265400-3	MOUNT CHARLESTON LODGE	3616	11539	0751	49	01				76	10
374	265415-3	MOUNT GRANT	3834	11849	0901	52	04				74	03
375	265436-3	MOUNT MONTGOMERY	3758	11819	0711	59	06			U	60	05
376	265440-1	MOUNT ROSE BOWL	3921	11952	0741	73	10	UU			83	02
377	265440-1	MOUNT ROSE BOWL	3921	11952	0750	83	09	12			84	11
378	265440-1	MOUNT ROSE BOWL	3921	11952	0750	85	12	12			87	12
379	265441-1	MOUNT ROSE CHRISTMAS TR	3921	11952	0724	68	04			U	87	10
380	265441-1	MOUNT ROSE CHRISTMAS TR	3921	11952	0723	87	10			U	88	10
381	265441-1	MOUNT ROSE CHRISTMAS TR	3921	11952	0724	88	10			7	99	99
382	265445-1	MOUNT ROSE HIGHWAY STN	3920	11953	0737	59	06	UU			68	05
383	265447-1	MOUNT ROSE SKY TAVERN	3921	11952	0751	70	07	UU			73	10
384	265585-1	NINE MILE PASS	4142	11817	0540	60	12				74	10
385	265605-1	NIXON	3948	11920	0391	48	07	UU			53	06
386	265605-1	NIXON	3950	11921	0390	62	07	UU			74	08
387	265683-2	NORTH FORK 10 S	4120	11546	0613	71	07	UU			72	10
388	265687-2	NORTH FORK 13 N	4141	11547	0628	72	10	UU			74	03
389	265688-2	NORTH FORK 7 NW	4134	11554	0660	74	08	UU			82	09
390	265691-2	NORTH FORK MNTC STN	4129	11549	0620	48	07	U			71	07
391	265695-2	NORTH FORK SPRING CREEK	4131	11552	0637	51	10				52	08
392	265705-4	NORTH LAS VEGAS DOXARM	3612	11505	0182	51	02	UU			61	07
393	265705-4	NORTH LAS VEGAS	3613	11508	0188	90	01	12			99	99
394	265718-2	OASIS 5 S	4057	11431	0570	85	08	12			87	05
395	265722-2	OASIS	4102	11430	0583	87	05	12			99	99
396	265760-2	OLD RUTH	3916	11459	0703	78	08	UU			85	11
397	265818-1	OROVADA	4134	11747	0430	48	07	UU	U		67	08
398	265818-1	OROVADA	4134	11747	0431	67	08	UU	U		85	05
399	265818-1	OROVADA	4134	11747	0431	85	05	1U			89	05
400	265818-1	OROVADA 4 WSW	4133	11750	0429	89	05	12			99	99
401	265819-1	OROVADA 9 SSW	4127	11750	0415	71	01	UU			75	04
402	265840-2	OVERLAND PASS	4001	11535	0679	54	07				66	09
403	265842-2	OVERLAND PASS 2	4001	11535	0675	66	10				76	07
404	265846-4	OVERTON	3633	11427	0128	48	07	UU		U	52	07
405	265846-4	OVERTON	3631	11426	0124	52	07	UU		U	54	09
406	265846-4	OVERTON	3632	11426	0122	54	09	UU		U	61	12
407	265846-4	OVERTON	3631	11425	0122	61	12	UU		U	68	01
408	265846-4	OVERTON	3632	11427	0129	88	03	12		7	88	11
409	265869-2	OWYHEE	4157	11606	0539	48	07	UU		U	82	01
410	265869-2	OWYHEE	4157	11606	0540	82	01	UU		U	83	06
411	265869-2	OWYHEE	4157	11606	0540	83	06	12		U	85	04
412	265880-4	PAHRANAGAT W L REFUGE	3716	11507	0340	64	03	UU		U	86	07
413	265880-4	PAHRANAGAT W L REFUGE	3716	11507	0340	86	07	12		U	99	99
414	265890-4	PAHRUMP 2 N	3615	11559	0285	48	10				58	06
415	265890-4	PAHRUMP	3613	11600	0283	58	06	UU			69	01
416	265890-4	PAHRUMP	3613	11601	0270	69	01	UU			80	12
417	265890-4	PAHRUMP UNIV OF NEVADA	3612	11559	0267	80	12	UU			88	09
418	265890-4	PAHRUMP	3612	11559	0267	88	09	12			99	99
419	265897-4	PAHRUMP RANCH	3612	11559	0267	48	07				52	05
420	265907-1	PAHUTE MEADOWS RANCH	4118	11856	0438	63	07	UU			79	07
421	265915-2	PALISADES	4036	11612	0483	67	05				99	99
422	265931-3	PALMETTO	3728	11746	0591	48	07				54	03
423	265990-1	PARADISE HILL	4117	11742	0450	59	12	UU			70	10
424	266000-1	PARADISE VALLEY	4130	11732	0465	48	07				51	07
425	266005-1	PARADISE VALLEY RANCH S	4130	11732	0465	48	07	UU			54	07
426	266005-1	PARADISE VALLEY 6 ENE	4131	11725	0471	54	07				54	12
427	266005-1	PARADISE VALLEY RANCH S	4130	11732	0468	54	12	UU			87	02
428	266005-1	PARADISE VALLEY RANCH S	4130	11732	0468	87	02	12			99	99
429	266055-1	PARIS RANCH	4013	11741	0414	66	06	UU			89	07
430	266055-1	PARIS RANCH	4013	11741	0414	89	07	12			99	99

431	266068-2	PARKER RANCH	4005	11437	0591	70	02	UU	U	71	10
432	266130-3	PENOYER VALLEY	3737	11547	0480	67	02	UU		72	03
433	266130-3	PENOYER VLY CASTLETON	3737	11547	0480	86	04	12		89	07
434	266130-3	PENOYER VLY CASTLETON	3737	11547	0480	90	01	12		99	99
435	266148-2	PEQUOP	4104	11432	0600	48	07	UU	U	59	04
436	266148-2	PEQUOP	4104	11432	0603	59	04	UU	U	85	07
437	266148-2	PEQUOP	4104	11432	0603	85	07		7	88	09
438	266160-2	PEQUOP SUMMIT	4105	11432	0731	64	10			66	09
439	266160-2	PEQUOP SUMMIT	4105	11432	0731	66	10			76	10
440	266235-3	PINE CANYON	3724	11414	0651	49	12			76	09
441	266242-2	PINE VALLEY BAILEY RANC	4025	11607	0505	82	05	12		99	99
442	266252-3	PIOCHE	3756	11427	0612	48	07	UU		66	05
443	266252-3	PIOCHE	3756	11427	0613	66	05	UU		71	08
444	266252-3	PIOCHE	3756	11427	0617	71	08	UU		91	02
445	266252-3	PIOCHE	3756	11427	0618	91	02	12		99	99
446	266290-1	PLEASANT VALLEY	3921	11946	0480	50	01			52	09
447	266305-1	POLE CREEK	4054	11734	0604	52	09			76	07
448	266349-2	PRIMEAUX	4040	11619	0600	48	07	UU		54	01
449	266349-2	PRIMEAUX	4040	11619	0576	54	01	UU		54	08
450	266504-1	QUINN RIVER CROSSING	4134	11826	0409	48	07			54	11
451	266574-2	RAND RANCH PALISADE	4026	11607	0505	56	10	UU		82	05
452	266630-3	RATTLESNAKE	3827	11610	0592	48	07			63	05
453	266642-2	RATTLESNAKE CANYON	4032	11531	0751	65	10			76	07
454	266691-3	RED ROCK CANYON ST PK	3605	11527	0378	77	05	UU		86	03
455	266691-3	RED ROCK CANYON ST PK	3605	11527	0378	86	03	12		99	99
456	266733-3	RED ROCK SUMMIT	3608	11532	0651	48	07			64	07
457	266742-2	REED RANCH	4126	11651	0547	60	06			74	10
458	266746-3	REESE RIVER RANGER STN	3859	11728	0665	72	03	UU		87	05
459	266746-3	REESE RIVER O'TOOLE	3904	11725	0655	87	10	12		99	99
460	266748-2	REESE VALLEY ATEN	4003	11714	0491	76	07	UU		81	04
461	266748-2	REESE VALLEY CARPER	4003	11714	0490	81	04	UU		84	07
462	266750-2	REESE VALLEY POWERS	4001	11716	0491	71	02	UU		72	04
463	266754-2	REESE VALLEY SMITH	4008	11716	0480	72	03	UU		76	07
464	266779-1	RENO WSFO AIRPORT	3930	11947	0440	48	01	UU	U	99	99
465	266784-1	RENO KIETZKE	3932	11947	0443	65	03			99	99
466	266787-1	RENO VA ST BRIDGE	3932	11949	0448	70	08			99	99
467	266905-3	ROBERTS RANCH	3610	11535	0611	48	07			76	07
468	266912-2	ROBIN RANCH	3958	11441	0624	68	08	UU	U	70	02
469	266918-2	ROBINSON SUMMIT	3925	11505	0763	53	10			66	09
470	266948-2	RODEO FLAT	4135	11557	0680	63	09			76	09
471	267123-2	RUBY LAKE	4012	11530	0601	48	07	UU	U	99	99
472	267149-1	RUCKS CABIN	4141	11733	0751	59	09			74	10
473	267175-2	RUTH	3917	11459	0683	58	06	UU		78	08
474	267175-2	RUTH	3917	11500	0686	85	12	12		88	09
475	267175-2	RUTH	3917	11459	0684	88	09	12		99	99
476	267192-1	RYE PATCH DAM	4028	11818	0416	48	07	UU	UU	52	04
477	267192-1	RYE PATCH DAM	4028	11818	0414	52	05	UU	UU	82	01
478	267192-1	RYE PATCH DAM	4028	11818	0413	82	01	UU	UU	85	04
479	267192-1	RYE PATCH DAM	4028	11818	0413	85	04	1U	UU	99	99
480	267224-2	SADLER RANCH	4012	11544	0569	54	07			76	07
481	267261-1	SAND PASS	4019	11948	0390	48	07	UU		72	07
482	267284-2	SAN JACINTO	4153	11441	0520	48	07			49	05
483	267319-3	SARCOBATUS	3716	11701	0402	48	07			61	07
484	267324-2	SAVAL RANCH	4117	11555	0637	60	07	UU		70	04
485	267330-2	SCHELLBOURNE	3948	11443	0616	48	07			58	08
486	267330-2	SCHELLBOURNE	3948	11444	0613	58	08			66	12
487	267335-2	SCHELLBOURNE PASS	3948	11439	0816	53	10			76	07
488	267358-3	SCHURZ	3857	11849	0412	48	07			57	05
489	267369-4	SEARCHLIGHT	3528	11455	0354	48	07	UU	U	84	12
490	267369-4	SEARCHLIGHT	3528	11455	0354	84	12	12	U	99	99
491	267397-2	SEVENTY ONE RANCH	4054	11519	0545	49	07		U	78	09
492	267430-1	SHEEP RANCH CANYON	4037	11733	0560	59	09			74	10
493	267443-1	SHELDON	4151	11938	0651	48	07	UU		72	02
494	267450-2	SHOSHONE 5 N	3855	11424	0593	88	10	12		99	99

495	267463-3	SILVERPEAK	3740	11735	0426	67	09	UU	U	87	11
496	267463-3	SILVERPEAK	3740	11735	0426	87	11	12	5	99	99
497	267609-1	SMITH	3849	11920	0475	48	07	UU		66	11
498	267612-1	SMITH 6 N	3857	11920	0500	73	07	UU	U	86	09
499	267612-1	SMITH 6 N	3857	11920	0500	86	09	12	U	99	99
500	267618-1	SMOKE CREEK ESPIL	4037	11945	0385	87	12	12		99	99
501	267620-3	SMOKEY VALLEY	3847	11710	0562	49	06	UU	U	85	04
502	267620-3	SMOKEY VALLEY	3847	11710	0562	85	04	1U	U	99	99
503	267640-3	SNOWBALL RANCH	3904	11612	0716	66	09	UU	U	99	99
504	267680-2	SOLDIER CREEK	4047	11518	0721	48	11			76	07
505	267682-1	SOLDIERS MEADOW	4121	11910	0455	62	06	UU		68	04
506	267686-1	SONOMA MOUNTAIN	4052	11736	0842	52	10			69	09
507	267695-1	SPARKS TRUCKEE RIVER	3931	11944	0439	78	11			99	99
508	267697-1	SPARKS	3933	11944	0436	88	11	12		99	99
509	267702-1	SPAULDING CANYON	4033	11751	0591	59	09			74	10
510	267710-1	SPOONERS STN	3906	11955	0703	51	10			81	04
511	267750-3	SPRING VALLEY ST PK	3802	11411	0595	74	08	12		76	11
512	267750-3	SPRING VALLEY ST PK	3802	11411	0595	76	11	12	7	99	99
513	267806-1	STATELINE-HARRAH'S	3858	11957	0625	84	01	12		99	99
514	267820-1	STEAD	3937	11953	0512	85	03	12		99	99
515	267825-1	STEWART	3907	11943	0462	67	07			99	99
516	267855-3	STONE CABIN VALLEY	3809	11635	0561	68	06	UU		71	10
517	267873-1	SULPHUR	4054	11840	0404	48	07			53	01
518	267908-3	SUNNYSIDE	3826	11501	0533	48	07	UU	U	62	07
519	267908-3	SUNNYSIDE	3825	11501	0531	65	10	UU	U	85	08
520	267908-3	SUNNYSIDE	3825	11501	0530	85	08	UU	U	86	07
521	267908-3	SUNNYSIDE	3825	11501	0530	86	07	12	U	99	99
522	267925-4	NORTH LAS VEGAS DOXARM	3612	11505	0182	61	08	UU		64	01
523	267925-4	SUNRISE MANOR LAS VEGAS	3612	11505	0182	64	01	UU		83	07
524	267925-4	SUNRISE MANOR LAS VEGAS	3612	11505	0182	84	12	12		89	11
525	267953-1	SUTCLIFFE	3957	11937	0388	67	05			72	02
526	267953-1	SUTCLIFFE	3957	11937	0400	72	02			74	03
527	267953-1	SUTCLIFFE	3957	11937	0399	74	03			79	08
528	267953-1	SUTCLIFFE WARRIOR POINT	4003	11938	0399	79	08	UU		85	07
529	267953-1	SUTCLIFFE	3957	11937	0398	86	03	12		99	99
530	267965-2	TAYLOR CANYON	4112	11606	0620	63	08			76	09
531	267983-3	TEMPIUTE 4 NW	3741	11543	0489	70	03	UU		86	04
532	268010-1	THACKER PASS	4143	11807	0500	60	12			74	10
533	268034-3	THORNE	3836	11836	0420	48	07			50	05
534	268160-3	TONOPAH	3804	11714	0609	48	07			50	12
535	268160-3	TONOPAH	3804	11714	0602	51	01			54	06
536	268165-3	TONOPAH 7 E	3804	11705	0543	75	05		U	76	05
537	268170-3	TONOPAH AIRPORT	3804	11707	0542	51	04	UU		53	12
538	268170-3	TONOPAH AIRPORT	3804	11705	0542	54	01	UU		82	01
539	268170-3	TONOPAH AIRPORT	3804	11705	0543	82	01	UU		87	02
540	268170-3	TONOPAH AP	3804	11705	0543	87	02	UU		99	99
541	268186-1	TOPAZ LAKE	3842	11931	0502	57	07	UU	U	82	01
542	268186-1	TOPAZ LAKE	3842	11931	0502	82	01	12	5	86	02
543	268202-1	TOPAZ LAKE 4 N	3845	11931	0558	86	10	12		99	99
544	268250-1	TRACY USGS	3934	11931	0424	77	11			99	99
545	268346-2	TUSCARORA	4119	11614	0618	57	05	UU		77	04
546	268346-2	TUSCARORA	4119	11614	0617	77	04	UU		85	06
547	268346-2	TUSCARORA	4119	11614	0617	85	06	1U		88	06
548	268346-2	TUSCARORA	4119	11614	0617	88	06	12		90	01
549	268346-2	TUSCARORA	4119	11614	0617	90	05	12		99	99
550	268349-2	TUSCARORA WILLIAMS RANC	4121	11604	0640	48	07			53	11
551	268349-2	TUSCARORA ANDRAE RANCH	4124	11605	0586	54	05			57	04
552	268424-3	TWIN RIVERS	3854	11715	0651	55	10			64	07
553	268443-3	TWIN SPRINGS FALLINI	3812	11611	0530	85	08	12		99	99
554	268500-1	UNIV OF NEVADA EXPERIME	3931	11947	0451	49	01			55	05
555	268510-3	UPPER WILLIAMS RANCH	3611	11541	0580	64	07			76	07
556	268538-3	URSINE	3759	11413	0576	64	04	UU		71	03
557	268538-3	URSINE	3759	11413	0583	71	03	UU		72	12
558	268543-3	URSINE SPRING VALLEY	3803	11410	0580	54	08			55	12

559	268588-4	VALLEY OF FIRE ST PK	3626	11431	0200	72	11	UU		85	03
560	268588-4	VALLEY OF FIRE ST PK	3626	11431	0200	85	03	1U		99	99
561	268689-1	VERDI	3931	12000	0485	51	04			52	04
562	268689-1	VERDI	3931	11959	0488	55	10			58	12
563	268761-1	VIRGINIA CITY	3918	11939	0635	51	04	UU		52	04
564	268761-1	VIRGINIA CITY	3918	11938	0600	52	04	UU		68	04
565	268761-1	VIRGINIA CITY	3918	11938	0635	68	04	UU		84	02
566	268761-1	VIRGINIA CITY	3918	11938	0635	84	02	1U		88	03
567	268761-1	VIRGINIA CITY	3918	11938	0634	88	03	12		99	99
568	268776-1	VIRGIN VALLEY	4152	11901	0481	51	10	UU		59	08
569	268794-1	VISTA	3931	11941	0437	60	09			99	99
570	268810-1	VYA	4135	11955	0566	59	09	UU		80	09
571	268822-1	WABUSKA 5 SE	3905	11907	0430	71	10	UU	U	84	03
572	268822-1	WABUSKA 5 SE	3905	11907	0430	84	03	12	U	86	05
573	268822-1	WABUSKA 5 SE	3905	11907	0430	86	05	12	5U	90	08
574	268822-1	WABUSKA 5 SE	3905	11907	0430	90	08	12	U	99	99
575	268834-1	WADSWORTH	3938	11917	0408	48	07			49	05
576	268838-1	WADSWORTH 4 N	3942	11917	0420	74	08	UU	U	86	11
577	268838-1	WADSWORTH 4 N	3942	11917	0420	86	11	12	U	99	99
578	268842-1	WADSWORTH USGS	3938	11916	0404	75	01			86	10
579	268977-1	WELLINGTON RANGER STN	3845	11922	0484	48	07	UU	U	73	05
580	268988-2	WELLS	4107	11458	0563	48	07	UU	U	62	11
581	268988-2	WELLS	4107	11458	0565	62	11	UU	U	86	02
582	268988-2	WELLS	4107	11458	0565	86	02	12	U	99	99
583	269025-2	WEST FORK BEAVER CREEK	4128	11539	0620	65	10			76	07
584	269044-3	WHEELER PASS	3623	11549	0751	63	08			76	07
585	269055-2	WHITE HORSE PASS	4021	11414	0659	53	10			76	07
586	269072-2	WILDHORSE RESERVOIR	4140	11547	0623	82	11	12		85	11
587	269072-2	WILDHORSE RESERVOIR	4140	11547	0623	85	11	12	7	85	12
588	269072-2	WILDHORSE RESERVOIR	4140	11547	0623	85	12	12	7	99	99
589	269122-2	WILKINS	4126	11445	0564	48	07	UU		80	05
590	269126-2	WILKINS WINE CUP RANCH	4124	11440	0570	80	05	UU		80	09
591	269133-2	WILLOW CREEK SUMMIT	4112	11622	0637	53	10			76	07
592	269137-3	WILLOW SPRINGS	3826	11712	0613	48	07			49	05
593	269154-3	WILSON CREEK SUMMIT	3821	11421	0711	53	10			76	07
594	269159-4	WILSON TANK SUMMIT	3557	11527	0492	65	07			66	09
595	269159-4	WILSON TANK SUMMIT	3557	11527	0492	66	10			76	07
596	269166-2	WINNEMUCCA MEL ST BR	4058	11744	0426	75	05			86	03
597	269166-2	WINNEMUCCA MEL ST BR	4058	11744	0425	86	03			99	99
598	269171-1	WINNEMUCCA WB CITY	4058	11743	0429	48	01			49	09
599	269171-1	WINNEMUCCA WSO AIRPORT	4054	11748	0430	49	09	UU	U	99	99
600	269229-1	YERINGTON	3859	11910	0438	48	07	UU		61	01
601	269229-1	YERINGTON	3900	11910	0438	61	01	UU		67	05
602	269229-1	YERINGTON	3859	11910	0438	67	06	UU		76	04
603	269229-1	YERINGTON	3900	11910	0438	76	04	UU		99	99
604	269234-1	YERINGTON SCS Y 1	3859	11910	0438	48	07		U	65	03
605	269234-1	YERINGTON SCS Y 1	3900	11910	0438	67	05		U	71	10
606	269387-3	YOMBA SCHOOL	3859	11728	0666	52	09			72	07
607	-										
608	-										

...back to Home Page.

Western Regional Climate Center, Greg McCurdy, gmwrcc@dri.edu

Jim Ashby
Dorothy Miller
11-13-98

$45.00

Dan

ftp address Dan 4/2/04
~~ftp:// ftp.dri.edu/wrcc/wco~~
sub directory
ftp:// ftp.dri.edu/wrcc/wso

AMERIC~1.0

Ordering precipitation data.

	Count	Coop No	Ann. P from French			
✓ Adaven:	7	260046-3	12.75	48-07	80-06	-32 yrs
/ adaven/oday	8	260046-3		80-12	82-04	

Dan 4/2/04

1.4 mb

Dan

024

? Beatty.day	38	260714-4	6.27	48	57	24 yrs
"	39	"		57	58	
"	40	"		58	72	
✓ Beatty 8N.day	41	260718-4		72	84	~26 yrs
"	42	"		84	98	
✓ Caliente.day	73	261358-3	8.83	48	84	36 yrs
"	74	"		84	Dan 4/2/04 98	15 yrs
✓ Goldfield.day	209	263285-3	5.70	48	50	2 yrs
"	210	"		50	84	34 yrs
"	211	"		85	Dan 4/2/04 98	13 yrs
✓ Las Vegas.day (Dan 4/2/04)	284	264429-4	3.98	48	56	8
" WB Airport	285	264434-4		48	49	1
" WSO Airport	286	264436-4		49	75	26
" "	287	264436-4		76	98	22
✓ Tonopah Airport.day	537	268170-3		51	53	2
	538	"	6.26	54	82	28
	539	"		82	87	5
	540	"		87	98	11

Headings for weather files   DAW 11-17-98   1/2

: BACKGROUND INFORMATION ON :
: SUMMARY OF THE DAY LISTING FOR NOAA COOPERATIVE STATIONS.
:
S: STATE NUMBER
: STN: NCDC STATION NUMBER
: YER: YEAR
: MM: MONTH
: DD: DAY OF MONTH
: HH: HOUR OF OBSERVATION
: PCPN: 24-HOUR PRECIPITATION [HUNDREDTHS OF INCHES]
: SNFL: 24-HOUR SNOWFALL [TENTHS OF INCHES]
: SNDP: SNOW DEPTH AT OBSERVATION [WHOLE INCHES]
: TMAX: 24-HOUR MAXIMUM TEMPERATURE [WHOLE DEGREES F]
: TMIN: 24-HOUR MINIMUM TEMPERATURE [WHOLE DEGREES F]
:
:
: IMMEDIATELY AFTER EACH OBSERVATION ARE TWO FLAGS;
: THE FIRST IS A MEASUREMENT FLAG AND THE SECOND IS A QUALITY FLAG
: THE FOLLOWING FLAGS ARE USED BY NCDC--->
: POSSIBLE VALUES OF MEASUREMENT FLAG:
: A: ACCUMULATED AMOUNT
: B: ACCUMULATED AMOUNT INCLUDES ESTIMATED VALUES
: E: ESTIMATED (SEE SECOND FLAG FOR METHOD OF ESTIMATION
: J: VALUE HAS BEEN MANUALLY VALIDATED
: M: DATA IS MISSING ← set to neg.
: S: INCLUDED IN A SUBSEQUENT VALUE
: T: TRACE (DATA = 00000 IN THIS CASE)
: (: EXPERT SYSTEM EDITED VALUE, NOT VALIDATED
): EXPERT SYSTEM APPROVED EDITED VALUE
. >: OSC FLAG; ORIGINAL DATA DATA VALUE TOO HIGH TO STORE
: <: OSC FLAG; ORIGINAL NCDC DATA VALUE TOO LOW TO STORE
: : (BLANK) NO FLAG NEEDED
:
: POSSIBLE VALUES OF QUALITY FLAG:
: 0: VALID DATA ELEMENT (FOR ORIGINAL DATA ONLY)
: 1: VALID DATA ELEMENT (FOR "UNKNOWN" SOURCE)
: 2: INVALID DATA ELEMENT, REPLACED BY SUBSEQUENT VALUE
: 3: INVALID DATA ELEMENT, NOT REPLACED
: 4: VALIDITY UNKNOWN (NOT CHECKED)
: 5: ORIGINAL NON-NUMERIC REPLACED BY DECIPHERED NUMERIC
: A: SUBSTITUTED TOBS FOR TMAX OR TMIN
: B: TIME SHIFTED VALUE
: C: ESTIMATED BY 10:1 RATIO, PRECIP FROM SNOWFALL
: D: TRANSPOSED DIGITS
: F: ADJUSTED TMAX OR TMIN BY +- A MULTIPLE OF 10 DEGREES
: G: CHANGED SIGN
: H: MOVED DECIMAL POINT
: I: OTHER RESCALING THAN F,G,H
:
: J: EDUCATED GUESS (SUBJECTIVELY DERIVED VALUE)
: K: EXTRACTED FROM AN ACCUMULATED VALUE
: L: SWITCHED TMAX AND TMIN
: M: SWITCHED TOBS FOR TMAX OR TMIN
: N: SUBSTITUTION OF "3 NEAREST STATION MEAN"
O: SWITCHED SNOW AND PRECIPITATION AMOUNT
: P: ADDED SNOWFALL TO SNOWDEPTH
: Q SWITCHED SNOWFALL AND SNOW ON GROUND
: R: PRECIPITATION NOT REPORTED - ZERO ESTIMATED
: S: MANUALLY EDITED VALUE
: T: FAILED INTERNAL CONSISTENCY CHECK

025 DAW

```
: U:  FAILED AREAL CONSISTENCY CHECK (BEGINNING OCT 1992)
: ):  EXPERT SYSTEM APPROVED EDITED VALUE
:
  STATION NUMBER 260718   BEATTY 8 N
. OVERALL PERIOD CONSIDERED: 19000101-19981231
: WINDOW (START AND END)    : 0101-1231
: Note: Corrected Data may follow, out of time order
:
:YERMMDDHH PCPN   SNFL   SNDP   TMAX   TMIN
:--------- ------ ------ ------ ------ ------
:
1972120118    0 1    0 1    0 1   63 1   36 1
1972120218    0 1    0 1    0 1   63 1   26 1
```

026

SAMPLE

bj: **Precipitation programs**
Date: 11/23/98 12:43:38 PM Mountain Standard Time
From: ag1rocaj@uco.es (José_Roldán)
To: woolhiserd@aol.com

Dave

File: Precipit.mim (149070 bytes)
DL Time (31200 bps): < 1 minute

This message is a multi-part MIME message and will be saved with the default filename Precipit.mim

---

Dave: I am sending again this mail because I have found that it has not been delivered. Jose
Date: Fri, 20 Nov 1998 20:55:25 +0100
>To: Dave
>From: José Roldán <ag1rocaj@lucano.uco.es>
>Subject: Precipitation programs
>X-Attachments: C:\Fatima\MULTIPLE\Mcfo1.for; C:\Fatima\MULTIPLE\Mcso1.for; C:\Fatima\MULTIPLE\Mcso2.for; C:\Fatima\MULTIPLE\Tjt1.seg; C:\Fatima\MULTIPLE\Tjt2.seg; C:\Fatima\MULTIPLE\Ttjjtt1.1; C:\Fatima\MULTIPLE\Ttjjtt2.1; C:\Fatima\MULTIPLE\Ttjjtt3.1; C:\Fatima\MULTIPLE\Ttjjtt4.1; C:\Fatima\ALFACONS\Melsi.for; C:\Fatima\ALFACONS\Ttjjtt;
>
>Dear Dave:
>I am attaching Fortram programs we have to run Markov chain (first,MCFO1, d second order, MCSO1 and MCSO2) and mixed exponential distribution,MELSI, in a PC. Also, I am including the card with input data (number of years; etc). There are two versions for the second order Markov chain because we need to change the number of periods (the most complete is MCSO2.for). The only problem is that many instructions are in spanish. Then you can ask Rosalia for the translation. If you can not run the programs or you have any other problem please tell me. Fatima is not here at the present because she has found a work in a plan devoted to modernization of traditional irrigations. However, I can contact with her in the weekend.
>I hope you have a nice pre-Thanksgiving and real Thanksgiving at Austin. Give my best regards to everybody, specially to Kay and you. Jose.

----------------------- Headers -----------------------

Return-Path: <ag1rocaj@lucano.uco.es>
Received: from rly-zd02.mx.aol.com (rly-zd02.mail.aol.com [172.31.33.226]) by air-zd01.mail.aol.com (v51.29) with SMTP; Mon, 23 Nov 1998 14:43:37 -0500
Received: from lucano.uco.es (lucano.uco.es [150.214.110.200])
by rly-zd02.mx.aol.com (8.8.8/8.8.5/AOL-4.0.0)
with SMTP id OAA20048 for <woolhiserd@aol.com>;
Mon, 23 Nov 1998 14:30:50 -0500 (EST)
X-quien: agrhid08 [150.214.116.218]
Received: from agrhid08.uco.es (agrhid08 [150.214.116.218]) by lucano.uco.es (8.6.12/8.6.12) with SMTP id UAA19014 for <woolhiserd@aol.com>; Mon, 23 Nov 1998 20:30:39 +0100
Message-Id: <3.0.1.32.19981123202804.007af200@lucano.uco.es>
X-Sender: ag1rocaj@lucano.uco.es
Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Mon, 23 Nov 1998 20:28:04 +0100
To: woolhiserd@aol.com

bj: **MIME encoding** 028
Date: 3/1/99 10:57:23 AM Mountain Standard Time
From: unkrich@tucson.ars.ag.gov (Carl Unkrich)
To: WOOLHISERD@aol.com (Dave Woolhiser)

File: mclog98.zip (566496 bytes)
DL Time (31200 bps): < 5 minutes

DAW

Dave,

I am attaching the files using a different type of encoding scheme -- there are only two choices in this e-mail utility (Netscape), so if this doesn't work, I would recomend downloading a demo copy of WinZip from www.winzip.com, which claims to be able to decode mime and uuencoded files.

Good luck,

Carl

Got notice that zip file is damaged

--
Carl Unkrich
Southwest Watershed Research Center
USDA-ARS
2000 East Allen Rd
cson, AZ 85719
_0.670.6380 x178

---------------- Headers ----------------
Return-Path: <unkrich@tucson.ars.ag.gov>
Received: from rly-yd05.mx.aol.com (rly-yd05.mail.aol.com [172.18.150.5]) by air-yd01.mail.aol.com (v56.26) with SMTP; Mon, 01 Mar 1999 12:57:22 -0500
Received: from diablo.tucson.ars.ag.gov (diablo.tucson.ars.ag.gov [198.22.133.2])
by rly-yd05.mx.aol.com (8.8.8/8.8.5/AOL-4.0.0)
with ESMTP id MAA01579 for <WOOLHISERD@aol.com>;
Mon, 1 Mar 1999 12:57:11 -0500 (EST)
Received: from tucson.ars.ag.gov (granite-creek [198.22.133.21])
by diablo.tucson.ars.ag.gov (8.9.1a/8.9.1) with ESMTP id JAA06134
for <WOOLHISERD@aol.com>; Mon, 1 Mar 1999 09:35:15 -0700 (MST)
Message-ID: <36DAC202.84819F0F@tucson.ars.ag.gov>
Date: Mon, 01 Mar 1999 09:36:18 -0700
From: Carl Unkrich <unkrich@tucson.ars.ag.gov>
Organization: USDA-ARS
X-Mailer: Mozilla 4.02 [en] (Win95; U)
MIME-Version: 1.0
To: Dave Woolhiser <WOOLHISERD@aol.com>
Subject: MIME encoding
Content-Type: multipart/mixed; boundary="------------B468821B5F49F390A77CEDD4"

`ubj: **Re: Daily Precipitation Data**
Date: 11/29/98 10:02:01 PM Mountain Standard Time
From: krwrcc@dri.edu
To: WOOLHISERD@aol.com

Dave

Dave,

Read your message after I got back from a trip, sent it to the printer, and today I come across it cleaning the mess off my desk. The day is right, but the month is off by 11 instead of 10 (a mere 10 percent error).

If you have a web browser, you could take a look at the data records yourself (not the actual values, but the **availability**). www.wrcc.dri.edu/climsum.html, select nevada or california, select a station, then look at "metadata graphics". Every day with data in the digital historical record is indicated with a colored dot. A solid filled diagram of sufficient length indicates a good candidate. If you pick something, I can send you the record.
Leaving soon for Portland and San Diego, back on Dec 3.

Kelly

>Dear Kelly,
>I am working on a project to create a daily weather simulator for future climate conditions at Yucca Mtn. To do that I will need to analyze long records of daily precip. at different elevations near that site using the
>logit transform for the transition probabilities for a first order Markov
>chain. I cannot use the results of Clayton Hanson et al. because they didn't
>use the transform (which is important for arid climates). I would like to
>obtain data from WRCC and would appreciate your advice regarding data quality.
>
>Best regards Dave Woolhiser
>woolhiserd@aol.com

---------------- Headers ----------------
Return-Path: <krwrcc@climate.dri.edu>
Received: from rly-zd04.mx.aol.com (rly-zd04.mail.aol.com [172.31.33.228]) by air-zd02.mail.aol.com (v51.29) with SMTP; Mon, 30 Nov 1998 00:02:01 1900
Received: from po.scs.unr.edu (po.scs.unr.edu [134.197.222.136])
by rly-zd04.mx.aol.com (8.8.8/8.8.5/AOL-4.0.0)
with ESMTP id AAA17758 for <WOOLHISERD@aol.com>;
Mon, 30 Nov 1998 00:02:00 -0500 (EST)
Received: from sage.dri.edu ([134.197.23.31])
by po.scs.unr.edu (8.9.0/8.9.0) with ESMTP id VAA11489
for <WOOLHISERD@aol.com>; Sun, 29 Nov 1998 21:03:19 -0800 (PST)
Received: from climate.sage.dri.edu (climate [134.197.23.13])
by sage.dri.edu (8.8.7/8.8.7) with ESMTP id VAA09168
for <WOOLHISERD@aol.com>; Sun, 29 Nov 1998 21:01:59 -0800 (PST)
Received: from localhost (localhost [127.0.0.1]) by climate.sage.dri.edu (8.7.1/8.7.1) with SMTP id VAA03495 for
VOOLHISERD@aol.com>; Sun, 29 Nov 1998 21:01:59 -0800 (PST)
Message-Id: <199811300501.VAA03495@climate.sage.dri.edu>
X-Authentication-Warning: climate.dri.edu: Host localhost [127.0.0.1] didn't use HELO protocol

Subj: **MCME program**
Date: 2/23/99 1:43:59 PM Mountain Standard Time
From: ag1rocaj@uco.es (José_Roldán)
To: woolhiserd@aol.com

File: Ftn.exe (1374918 bytes)
DL Time (31200 bps): < 12 minutes

Dear Dave:
I am sorry because I have been out for several days.
I am sending you the FORTRAN 77 program . Then you can make more changes if you want. To execute that program you have to put (for first order Markov chain, for example):

MOVE MCFO1.FOR c:\...\FTN\BIN
CD c:\...\FTN\BIN
FL MCFO1.FOR

I am sending another e-mail with the executable versions of the programs.
Praxedes is happy to hear you like "el dulce de membrillo". Also, we hope you have the opportunity to visit us in our new home.
Juan Vicente was last week in Arizona. He tried to call you but he couldn't.
Write me if you have any problem. Best regards to Kay. Jose

DAW

Jose Roldan
Profesor de Hidraulica y Riegos
Editor Cientifico "Ingenieria del Agua"
Departamento de Agronomia
E.T.S.Ingenieros Agronomos y Montes
Apdo. 3048
14080 Cordoba
Spain
Tel: 34 957 218512
Fax: 34 957 218569
E-mail: jroldan@uco.es

------------ Headers ------------
Return-Path: <ag1rocaj@uco.es>
Received: from rly-ya01.mx.aol.com (rly-ya01.mail.aol.com [172.18.144.193]) by air-ya05.mx.aol.com (v56.26) with SMTP; Tue, 23 Feb 1999 15:43:55 -0500
Received: from lucano.uco.es (lucano.uco.es [150.214.110.200])
by rly-ya01.mx.aol.com (8.8.8/8.8.5/AOL-4.0.0)
with ESMTP id OAA13638 for <woolhiserd@aol.com>;
Tue, 23 Feb 1999 14:28:16 -0500 (EST)
Received: from agrhid08.uco.es (agrhid08.uco.es [150.214.115.123])
by lucano.uco.es (8.9.2/8.9.1) with SMTP id UAA00272
for <woolhiserd@aol.com>; Tue, 23 Feb 1999 20:25:25 +0100 (MET)
X-quien: agrhid08.uco.es [150.214.115.123]
Message-Id: <3.0.1.32.19990223202235.007a6310@lucano.uco.es>
X-Sender: ag1rocaj@lucano.uco.es (Unverified)
X-Mailer: Windows Eudora Light Version 3.0.1 (32)

031

Preparation of Nat. Weather service data for input to Fortran programs for MCME model with logit transform.

1. Copy to a new file with extension .TXT

2. With MSDOS editor at beginning + end of record, start at Mar 1 and end at Feb 28

3. Remove leap year days

Note time of day that depth is observed - may affect transition probabilities.

4. Write BASIC program to prepare output file

Daily precip (in)	TMAX °F +100	TMIN °F +100
XX.XX	XXX.	XXX.

5. Modify Analysis programs for precipitation to accept this input. (obtained FORTRAN program from C. Richardson)

6. Write a BASIC program to estimate:

- W(1) annual mean of t_{max} for dry days
- W(2) amplitude of t_{max} for wet and dry days
- W(3) annual mean of the CV of t_{max} for wet or dry days
- W(4) amplitude of the CV " " " " "
- W(5) annual mean of t_{max} for wet days
- W(6) annual mean of t_{min} for wet or dry days
- W(7) amplitude of t_{min} for wet or dry days
- W(8) annual mean of CV of t_{min} for wet or dry days
- W(9) amplitude of CV of t_{min} " " "

7. Lag and cross-correlation coefficients - we will use the values used in USCLIMATE pp 5 + 6.

1. Identify parameters for Markov Chain - mixed exponential model for nearby stations.

032

A. Programs

1. MCF01.EXE Uses the logit transformation + fits Fourier series to logits of p_{00} and p_{10}. Revised input MCF01R.FOR — DAW

2. MELST.EXE Fits Fourier series to parameters of the mixed exponential model ~~and the first order MC model~~

5/20/99 DAW

1. Create file TTJJTT with the following — DAW 4/2/04

Line	Format		
1	11	I5	LMAXH = maximum number of ~~harmonics~~ parameters 2X Harmonics + 1
2.	12		THRES, NRE, NCOUNT, SCREEN, NLU, INIC
	F6.4, 2I5, F6.3, I4, I5		THRES = THRESHOLD in inches = 0.008 NRE = Number in matrix = 1301 NCOUNT = Number of years in analysis SCREEN = CRITICAL STAT VALUE = 5.990 Chi square NLU = Number of years to skip — DAW 4/2/04 INIC = YEAR THAT ~~ANALYSIS~~ Record BEGINS
3.	9	A	ONAME OUTPUT FILE NAME (alpha numeric)
4.	1515	I2	NUMEST Number of stations in data list
5.	9	PNAME	Name of data file # 1
6	9	"	Name of " " # 2
		etc	
		!	
		NUMEST	

8. For radiation we will use values interpolated from Figs A10 – A17 in USCLIMATE.

033

DAW

BASIC Program will be called DAYREAD.BAS

This program will convert the daily NWS data to

and will calculate the mean, amplitude and phase angles listed in step 6.

Suppose we represent each (or any) of these series as

F(I) I = 1, 365

If F(I) is represented by the Fourier Series

$$F(I) = \frac{a_0}{2} + \sum_{n=1}^{m} \left(a_n \cos \frac{n\pi I}{L} + b_n \sin \frac{n\pi I}{L} \right)$$

$$a_n = \frac{2}{m} \sum_{i=0}^{m-1} F(I) \cos \frac{n\pi I}{L} \qquad n = 0, 1, 2 \ldots$$

$$b_n = \frac{2}{m} \sum F(I) \sin \frac{n\pi I}{L} \qquad n = 1, 2, 3 \ldots$$

We read in TMAX(I,J) and TMIN(I,J) for each day for each year

Get SUMTMAX(J) and SUMTMIN(J) J = 1, 365

Then Get $STDTMAX = \sqrt{\frac{\Sigma(TMAX - TMAXBAR)^2}{NYR}}$

$STDTMIN = \sqrt{\frac{\Sigma(TMIN - TMINBAR)^2}{NYR}}$

CVTMAX(J) = STDTMA(J) / TMAXBAR(J)

CVTMIN(J) = STDTMIN(J) / TMINBAR(J)

(must be conditioned on wet or dry days)

5/19/99 Received word from Clarence Richardson that he will send the P.C. version of his FORTRAN program to calculate means, amplitudes etc for Tmax + Tmin ∴ will abandon the BASIC program for this analyses.

034

Continuing with step 4.

Test Program
a) Copy BEATTY~1.DAY to BEATTY~1.TXT

b) Edit as shown in 2. + 3.

data starts Mar. 1, 1949
data ends Feb 28, 1953
skip 5 lines

Beatty8N.DAY	1973022818	Line 161	365	
	73	526	365	
	74	891	365	(leap)
	1976	1252	366	
	1977	1622	365	
	78	1987	365	
	79	2352	365	
	80	2717	366	Leap
	81	3083	365	
	82	3448	365	
	83	3813	365	Leap
	84	4178	274	? Skips 8/1 to 10/31
	85	4452	365	
	86	4817	365	
	87	5182	365	
	88	5547	366	Leap
	89	5913	365	
	90	6278	365	
	91	6643	365	Leap
	92	7008	366	
	93	7374	365	
	94	7739	365	
	95	8104	365	
	96	8469	366	Leap
	97	8835	365	
		9200		
	98	2-28		
BEATTY8N.TXT	84	3965	273	
	85	4238		

Will remove 1984 data

starts in 1973 ends in 1997 24-1 = 24 yrs
8760-8 = 8760. 8760 ÷ 365 = 24

BEATTY8N.PTT has 8760 lines ✓

The File Beatty 8N.PTT should start with the station name (one line)

5/21/99 Revised MCFO1R.FOR Run BEATTY 8N.OUT 035

Prepare files for Caliente

DAW

1. Copy Caliente.day to Caliente.Txt ✓

2. Edit Caliente.Txt
   remove leap days ✓
   start @ Mar. 1 ✓
   end @ Feb 28 - not critical
   Check to make sure no missing data

Note: Following yrs were omitted 1930, 38, 42, 43, 44, 46, 56, 66, 69, 75, 76, 78, 86 Because they were incomplete.

5/24/99 Ran Beatty 8N with MCFO1R with 3 harmonics results look o.k.

Ran Caliente with MCFO1R with 3 harmonics ✓ results look o.k.

CALIENTE.OUT

Prepare files for Adaven

1. Copy Adaven.day to Adaven.TXT ✓

2. Edit Adaven.txt ✓
   start at Mar 1 ✓
   remove leap days ✓

5/25/99
Finished editing Adaven~1.TXT
.PTT — Total of 32 years. DAW 4/2/04

Years omitted: '28, 29, 31, 35-38, 42, 43, ~~44~~, 45-47, 49, 50, 53, 56, 57 71, 72

Ran Adaven ✓ ADAVEN.OUT

Prepare files for Las Vegas

1. Copy VEGAS.DAY to VEGAS.TXT ✓

2. Edit VEGAS.TXT
   start at Mar 1, 1949 ✓
   remove leap days ✓

Years omitted: 38, 48, 52,
Note: Read at both 24:00 & 18:00

Ran Vegas ✓ ✓ VEGAS.OUT

036

DAW

Prepare files for Goldfield

1. Copy GOLDFIEL.DAY to GOLDFIEL.TXT ✓
2. Edit GOLDFIEL.TXT
   - start at Mar 1 ✓
   - remove leap days ✓
   - check for missing days ✓

Years ommitted: 50, 51, 52, 53, 54, 55, 63, 64, 65, 72, 73, 81, 83, 84, 85, 88, 92

5/27/99

Run Goldfield ✓ ✓ GOLDFIEL.OUT

Prepare files for Tonopah

1. Copy TONOPAH.DAY to TONOPAH.TXT ✓
2. Edit TONOPAH.TXT
   - remove leap days ✓
   - check for missing days ✓

only 1 yr. omitted, 1989

Run DAYREAD.BAS ✓

Run MCF01R ✓ ✓ TONOPAH.OUT

Run MELSIREV

Files .01 .02 .03

1. TONOPAH ✓ ✓ TONOPME
2. BEATTY 8N ✓ ✓ ✓
3. ADAVEN ✓ ✓
4. VEGAS ✓ ✓
5. CALIENTE ✓ ✓
6. GOLDFIELD ✓ ✓

DAW 10/20/99 Rerun cases with revised input file.

Control files are of form *ME.CON
Copy to TTJJTT

Mean α = 0.314
Std dev = 0.069
95% confidence [0.2414, 0.4270]

Analyses of nearby rainfall data (Con't.)

Prepare a spreadsheet PSIPLOT to explore the relationships

between: G_{00} and annual precip
G_{10} " " "
C_{100}
C_{200}
C_{110}
C_{210}

$\bar{\alpha}$
$\bar{\beta}$
$\bar{\mu}$

037 DAW

File is MCMEPAR.PDW in SURF\CLIMATE

Create Plot of $\bar{G}_{00}$ and $\bar{G}_{10}$ vs annual precip
Add regression lines

$$\bar{G}_{00} = 3.07 - 0.00248\,\bar{P} \qquad r^2 = 0.719$$

$$\bar{G}_{10} = 0.932 - 0.00161\,\bar{P} \qquad r^2 = 0.463$$

where $\bar{P}$ is in mm

This compares with the following equations from Hanson and Woolhiser (1990)

$$\theta_1 = 2.046 - 0.0011\,X \qquad r^2 = 0.664$$

$$\theta_2 = 0.648 - 0.0013\,X \qquad r^2 = 0.859$$

where $\theta_1 = \ln\left(\bar{P}_{00}/1-\bar{P}_{00}\right)$

$\theta_2 = \ln\left(\bar{P}_{10}/1-\bar{P}_{10}\right)$

and X is the mean annual precipitation

Hanson + Woolhiser used data from 22 NWS stations in Idaho. Record lengths were approximately 40 yrs. The logits were also estimated differently. Hanson + Woolhiser transformed the probabilities obtained by direct optimization, whereas in this study the logits were estimated directly.

Hanson, C.L. and D.A. Woolhiser. 1990. Precipitation Simulation Model for Mountainous Areas. in Hydraulics and Hydrology of Arid Lands. Proc. of Int'l Symposium, HY and IR Div. / ASCE. San Diego CA. 578-583

ALVIN No. 5505 Engineer's Computation Pad

There are some problems with the data used in this study for example: some of the records are intermittent and the reading times at some stations changed during the period of record. Also there were different times of reading ie some at 24:00 some at 08:00 and some at 18:00.

when the amplitudes of the first and second harmonics of G_{00} and G_{10} are plotted against annual precip., there is no obvious trend.

when α, $\bar{\beta}$ and $\bar{\mu}$ are plotted against annual P, there is some trend if Las Vegas is omitted. for $\bar{\mu}$. There is a weak increasing trend for $\bar{\beta}$. It might be worthwhile to use a regional α. It also may be a good idea to increase the number of harmonics for μ

038

No. 5505 Engineer's Computation Pad

Form for *.TXT

039

Dave

: STATION NUMBER 260718   BEATTY 8 N
: OVERALL PERIOD CONSIDERED: 19000101-19981231
: WINDOW (START AND END)   : 0101-1231
 Iote: Corrected Data may follow, out of time order
:

measurement flag — quality flag

:YERMMDDHH	PCPN	SNFL	SNDP	TMAX	TMIN
:					
1972120118	0 1	0 1	0 1	63 1	36 1
1972120218	0 1	0 1	0 1	63 1	26 1
1972120318	0 1	0 1	0 1	60 1	27 1
1972120418	0T1	0T1	0T1	56 1	26 1
1972120518	0 1	0 1	0 1	54 1	22 1
1972120618	0 1	0 1	0 1	39 1	15 1
1972120718	0T1	0T1	0T1	44 1	22 1
1972120818	0 1	0 1	0 1	47 1	26 1
1972120918	0 1	0 1	0 1	41 1	12 1
1972121018	0 1	0 1	0 1	27 1	14 1
1972121118	0 1	0 1	0 1	27 1	13 1
1972121218	0 1	0 1	0 1	30 1	10 1
1972121318	0 1	0 1	0 1	30 1	15 1
1972121418	0 1	0 1	0 1	41 1	18 1
1972121518	0 1	0 1	0 1	46 1	22 1
1972121618	0 1	0 1	0 1	41 1	22 1
1972121718	0 1	0 1	0 1	43 1	28 1
1972121818	0 1	0 1	0 1	47 1	30 1
1972121918	0 1	0 1	0 1	60 1	27 1
1972122018	0 1	0 1	0 1	62 1	34 1
1-72122118	0 1	0 1	0 1	62 1	29 1
. /2122218	0 1	0 1	0 1	62 1	25 1
1972122318	0 1	0 1	0 1	60 1	33 1
1972122418	0 1	0 1	0 1	61 1	26 1
1972122518	0 1	0 1	0 1	57 1	32 1
1972122618	0 1	0 1	0 1	56 1	31 1
1972122718	0 1	0 1	0 1	61 1	25 1
1972122818	0T1	0T1	0 1	56 1	27 1
1972122918	0 1	0 1	0 1	41 1	26 1
1972123018	0 1	0 1	0 1	41 1	22 1
1972123118	0 1	0 1	0 1	48 1	19 1
1973010118	0 1	0 1	0 1	46 1	28 1
1973010218	0 1	0 1	0 1	44 1	24 1
1973010318	0 1	0 1	0 1	48 1	17 1
1973010418	1 1	3 1	0T1	46 1	20 1
1973010518	0 1	0 1	0 1	38 1	13 1
1973010618	0 1	0 1	0 1	41 1	14 1
1973010718	0 1	0 1	0 1	45 1	15 1
1973010818	0 1	0 1	0 1	43 1	15 1
1973010918	5 1	5 1	1 1	41 1	22 1
1973011018	0T1	0 1	0T1	35 1	30 1
1973011118	0 1	0 1	0 1	50 1	22 1
1973011218	0 1	0 1	0 1	53 1	22 1

1-10   16 to 17 depth in hundredths of inches   34-36   41-43

13-15   Tmax

ADAVEN 5/24/99 DAW

WORK SHEET
EDITING ADAVEN.TXT
To find missing data

040
DAW

Line

1928 9 1456
32 1465 1458
36 2923 1451
40 4374 1527
44 5801 1456
48 7257 1457
52 8714
56 10173
60 11600 1460
64 13060 1460
68 14520

76 17324

Annual

28 - 9 363 X
29 - 372 364 X
30 - 736 365
31 - 1101 364 X
32 - 1465 365
33 - 1830 365
34 - 2195 365
35 - 2560 363 X
36 - 2923 361 X
37 - 3284 362 X
38 - 3646 363 X
39 4009 365
40 4374

40 - 4374 365
41 4739 365
42 5104 334 X DAW 4/12/04
43 5438 ~~605~~ 363 ~~2X~~ DAW X 3/01 missing added
~~44 6043~~ 5801 365 DAW 4/12/04
45 6166 364 X
46 6530 364 X DAW 4/12/04
47 6894 364 X
48 7258 365
49 7623 363 X
50 7986 364 X
51 8350 365
52 8715 365
53 9080 364 X
54 9444 365
55 9809 365
56 10174 363 X
57 10537 334 X
58 10871 365
59 11236 365
60 11601 365
61 11966 365
62 12331 365
63 12696 365
64 13061 365
65 13426 365
66 13791

66 13791 365
67 14156 365
68 14521 365
69 14886 366
70 15251 365
71 15616 X
72 Missing 1/1/72 - 3/10/72 X
73 16230 365
74 16595 365
75 16960 365
76 17325 365
77 17690 365
78 18055 365 ✓
79 18420
80

Terminated @ 03/01/79
32 full years
Begin 1930
11680 ÷ 365 = 32 yrs - check.

5/28/99 1/2

p̄ = 12.75
ln p̄ = 2.546

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 260046 ADAVEN
RAINGAGE= 1 : STATION NUMBER 260046 ADAVEN
YEARS = 32 (SINCE 1930 TO 1961)

p̄ from this sample = 12.79"

0.11

OCCURRENCE PROCESS

32 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
309	50	49	38	359	87
350	37	38	23	387	61
326	47	48	27	373	75
346	44	40	18	390	58
344	33	38	33	377	71
379	29	28	12	408	40
373	29	29	17	402	46
373	30	32	13	403	45
412	16	14	6	428	20
372	30	30	16	402	46
315	52	50	31	367	81
332	41	45	30	373	75
373	28	28	19	401	47
387	24	22	15	411	37
388	26	26	8	414	34
400	20	21	7	420	28
408	18	18	4	426	22
396	19	18	15	415	33
366	32	31	19	398	50
363	32	34	19	395	53
370	33	29	16	403	45
339	39	41	27	378	68
317	41	40	36	358	76
318	41	44	30	359	74
305	46	43	33	351	76
324	52	54	30	376	84

NUMBER OF PARAMETERS CONSIDERED= 7

DAW

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.3924 -.89921E-01 -.37374 0.12667 -.14657
-.12660 0.31321E-01
Likelihood Function = -2977.34473

Optimum Parameter Estimates:

2.3793 -.18616E-01 -.35400 0.27332 -.27123
-.25734 0.18347

2/2

Adaven

042

Corresponding Amplitudes:

2.3793	0.35449	0.38505	0.31605

Corresponding Phase Angles:

0.0000	-1.6233	-.78157	2.5222

Likelihood Function = -2969.66187

Daw

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.57969 0.46737E-02 -.16673 0.14140 -.11991E-01
-.80632E-01 0.48191E-01
Likelihood Function = -947.470703

Optimum Parameter Estimates:

0.54422 0.42520E-01 -.14912 0.15500 -.93820E-01
-.13115 0.14542

Daw 4/7/04
3X,5(2X,G11.5)

Corresponding Amplitudes:

0.54422	0.15506	0.18118	0.19582

Corresponding Phase Angles:

0.0000	-1.2930	-.54431	2.3046

Likelihood Function = -946.338013

FINAL LOG LIKELIHOOD FUNCTION: -3916.00000
26; -3916.000000

5/28/99 1/2

$\bar{p} = 6.27$

$\ln \bar{p} = 1.836$

043

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 260718 BEATTY8N
RAINGAGE= 1 : STATION NUMBER 260718 BEATTY8N
YEARS = 24 (SINCE 1973 TO 1996)

$\bar{p}$ from this sample = 6.16"

OCCURRENCE PROCESS

Transitions

24 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
228	37	36	34	265	70
241	33	37	22	274	59
298	16	16	6	314	22
295	15	17	9	310	26
277	24	22	13	301	35
279	23	23	11	302	34
290	16	17	13	306	30
312	11	11	2	323	13
326	3	5	2	329	7
312	10	8	6	322	14
282	22	23	9	304	32
289	21	19	7	310	26
299	13	16	8	312	24
299	16	14	7	315	21
300	16	15	5	316	20
294	15	17	10	309	27
317	10	9	0	327	9
293	16	18	9	309	27
298	16	15	7	314	22
296	19	18	3	315	21
294	15	16	8	309	24
283	22	21	10	305	31
250	30	28	28	280	56
272	24	26	14	296	40
253	31	28	22	284	50
282	28	29	15	310	44

NUMBER OF PARAMETERS CONSIDERED= 7

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.7957 0.10169 -.44087 -.88447E-01 -.27936
0.41542E-01 0.14732
Likelihood Function = -1846.42664

Optimum Parameter Estimates:

2.7447 0.14576 -.45273 0.10679 -.29028
-.61791E-01 0.10873

Beatty 80

1/1

044

Corresponding Amplitudes:

2.7447	0.47562	0.30930	0.12506

Corresponding Phase Angles:

0.0000	-1.2593	-1.2183	2.0876

Likelihood Function = -1840.30237

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.87648 -.29210 -.43405 0.29549 -.10890
0.37111E-01 0.23426
Likelihood Function = -514.350464

Optimum Parameter Estimates:

0.67661 -.18847E-01 -.25681 0.12436 -.14940
0.11662 -.11219E-01

Corresponding Amplitudes:

0.67661	0.25750	0.19439	0.11715

Corresponding Phase Angles:

0.0000	-1.6441	-.87659	-.95906E-01

Likelihood Function = -506.033905

FINAL LOG LIKELIHOOD FUNCTION: -2346.33618
26; -2346.336180

Editing Work sheet Line CALIENTE 54 yrs

use 40

045

DAW

1932 0229	888	1460	1929	9		
1936	2348	1792	(30)	252		– March is missing
1940	3640	1458	31	523	365	
1944	5098	1457	32	888	365	
1948	6555	1460	33	1253	365	
1952	8015	1460	34	1618	365	
1956	9475	1448?	35	1983	365	
1960	10,923	1460	36	2348	365	
1964	12,383	1432?	37	2713	365	
1968	13,815	1399?	(38)	3078	298	67 days missing
1972	15,214	1430 ?	39	3376	364	1 day missing added Aug 31 = 30
1976	16,644	1398 ?	40	3640	365	
1980	18,042	1460	41	4005	365	
1984	19,502	1430 ?	(42)	4370	364	1 day
1988	20,932	1460	(43)	4734	364	1 day
1992	22,392	1460	(44)	5098	363	2 days
1996	23,852		45	5461	365	
Thru 1998	2 yrs		(46)	5826	364	1 day
			47	6190	365	
Detecting missing data			48	6555	365	
			49	6920	365	
			50	7285	365	
			51	7650	365	
			52	8015	365	
			53	8380	365	
			54	8745	365	
			55	9110	365	
			(56)	9475	353	
			57	9828		

CALIENTE, CON'T

57	9828	365	
58	10193	365	
59	10558	365	
60	10923	365	
61	11288	365	
62	11653	365	
63	12018	365	
64	12383	365	
65	12748	365	
(66)	13113	337]	
67	13450	365	
68	13815	365	
(69)	14180	304]	
70	14484	365	
71	14849	365	
72	15214	365	
73	15579	365	
74	15944	365	
(75)	16309	335	−30
(76)	16644	334	−31
77	16978	365	
(78)	17343	334	−31
79	17677	365	
80	18042	365	
81	18407	365	
82	18772	365	
83	19137	365	
84	19502		

84	19502	365
85	19867 16068	
(86)	16433	~~365~~ 335]
87	16768	365
88	17133	365
89	17498	365
90	17863	365
91	18228	365
92	18593	365
93	18958	365
94	19323	365
95	19688	365
96	20053	365
97	20418	365
98	20783	

changed to 8:00 reading

045A

← DAW

1/2

5/28/99

$\bar{p}$ = 8.83"

ln $\bar{p}$ = 2.178

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 261358 CALIENTE
RAINGAGE= 1 : STATION NUMBER 261358 CALIENTE
YEARS = 40 (SINCE 1929 TO 1968)

$\bar{p}$ from this sample = 8.80"

046

OCCURRENCE PROCESS

---

40 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

Daw.

NDD	NDW	NWD	NWW	ND	NW
415	43	43	44	458	87
390	58	57	41	448	98
431	41	46	39	472	85
467	39	32	22	506	54
408	49	56	47	457	103
446	44	42	28	490	70
445	46	42	27	491	69
513	16	23	8	529	31
503	23	20	9	526	29
433	47	43	35	480	78
375	69	74	42	444	116
380	65	64	51	445	115
439	45	47	29	484	76
479	32	29	20	511	49
478	28	29	25	506	54
465	30	30	30	495	60
456	37	39	28	493	67
484	28	30	18	512	48
445	44	43	28	489	71
459	36	37	18	495	55
430	38	34	30	468	64
399	52	52	33	451	85
416	55	55	34	471	89
407	59	61	33	466	94
399	61	56	44	460	100
421	66	67	43	487	110

NUMBER OF PARAMETERS CONSIDERED= 7

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.3414 0.42186E-02 -.22307 0.12341 -.16401
-.10224 0.52824E-01
Likelihood Function = -3814.76025

Optimum Parameter Estimates:

-.22243146 0.19998304E-01 -.21185 0.29937 -.28570

DAW Calcento

Corresponding Amplitudes:

2.3146	0.21264	0.41382	0.28610

Corresponding Phase Angles:

0.0000	-1.4846	-.76204	2.4614

Likelihood Function = -3805.12402

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.38758 0.35862E-01 -.26183E-01 -.15927 -.16506
-.10063E-01 0.38011E-01
Likelihood Function = -1324.93958

Optimum Parameter Estimates:

0.36420 0.77022E-02 -.18233E-01 -.10151 -.81055E-01
-.40240E-01 0.47511E-01

Corresponding Amplitudes:

0.36420	0.19793E-01	0.12990	0.62262E-01

Corresponding Phase Angles:

0.0000	-1.1711	-2.4678	2.2735

Likelihood Function = -1323.22754

FINAL LOG LIKELIHOOD FUNCTION: -5128.35156
26; -5128.351560

Daw

GOLDFIEL.TXT Reading at 18:00 until 82 then 9:05 then 17:00 in 83

1949

52 1060

60 2177 1404
64 3531 1302
68 4833 1460
72 6293 1004
76 7297 1460
80 8757 1358
84 10115 1034
88 11149 1429
92 12578 1430
96 14008

49 - 9 365
50 - 374 348
51 - 722 338
52 - 1060 X
52/12/30 - 53/6/10 53 X
54 1539 X
X
59 1762 365
60 2127 365
Check add 1 day missed 31 — 61 2492 364 ??
62 2856 365
63 3221

63 - 3221 310 X
64 - 3531 246 X
65 - 3777 326 X
66 - 4103 365
67 4468 365
68 4833 365
69 5198 365
70 5563 365
71 5928 365
72 6293 335 X
73 6628 304 X
75 6932 365
76 7297 365
77 7662 365
78 8027 365
79 8392 365
80 8757 365
81 9122 335 X ?
82 9457 365
83 9822 X
84 X
85 X
86 10419 365
87 10784 365
88 11149 334 X
89 11483

89 - 11483 365
90 11848 365
91 12213 365
92 12578 335 ? X
93 12913 365
94 13278 365
95 13643 366 ?? remove key! check
96 14009 365
97 14374 365
98 14739

?

98 14859

27 years

1104
1468 364

10563
− 8
10555
÷ 365 = 28.91

10729
− 9
10720
÷ 365 = 28 ✓

1949 –

DAW 5/28/99

$\bar{p}$ = 5.70"

ln $\bar{p}$ =

1/2

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 263285 GOLD
RAINGAGE= 1 : STATION NUMBER 263285 GOLDFIELD
YEARS = 28 (SINCE 1949 TO 1976)

$\bar{p}$ from this sample = 6.49"

OCCURRENCE PROCESS

28 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
287	38	43	18	325	61
308	30	30	13	338	43
330	25	25	9	355	34
325	29	29	9	354	38
326	29	27	9	355	36
314	26	32	16	340	48
338	22	20	10	360	30
342	17	17	16	359	33
362	11	14	5	373	19
344	18	18	12	362	30
315	30	27	20	345	47
340	21	24	7	361	31
335	23	23	11	358	34
344	19	18	11	363	29
349	20	17	6	369	23
368	9	12	3	377	15
370	9	11	2	379	13
343	17	15	10	360	25
337	17	17	7	354	24
330	18	17	8	348	25
322	17	14	9	339	23
314	22	24	4	336	28
312	25	30	22	337	52
318	29	27	15	347	42
320	23	24	22	343	46
327	36	32	14	363	46

NUMBER OF PARAMETERS CONSIDERED= 7

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.7574 -.18822 -.38450 0.41663E-01 -.15516
-.66721E-01 0.90660E-01
Likelihood Function = -2141.05981

Optimum Parameter Estimates:

-.17260364 0.18540885 -.33692 0.15112 -.23371

Daw Goldfield 7/2

050

Corresponding Amplitudes:

2.7364	0.35407	0.27831	0.25333

Corresponding Phase Angles:

0.0000	-1.8833	-.99680	2.3204

Likelihood Function = -2137.35986

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.80254 -.82429E-01 -.52035E-01 0.25086 0.77472E-01
0.63243E-02 -.72870E-01
Likelihood Function = -551.646545

Optimum Parameter Estimates:

0.73231 -.43930E-01 0.15542E-01 0.27687 -.34918E-01
0.18864 -.19431

Corresponding Amplitudes:

0.73231	0.46598E-01	0.27906	0.27081

Corresponding Phase Angles:

0.0000	2.8016	-.12546	-.80019

Likelihood Function = -549.849548

FINAL LOG LIKELIHOOD FUNCTION: -2687.20947
26; -2687.209470

WORKSHEET

VEGAS.TXT serviced at 24:00 DAW

5
52 1104 1459
56 2563 1460
60 4023 1460
64 5483 1460
68 6943 1460
72 8403 1460
76 9863 1460.
80 11323 730
82 12053 | 24:00
83 12422
84 12791 1,461 ?
88 14252 1,460
92 15712 1460
96 17172
98 17902
1940 19169 1460
47 20629

47 - 12/31

have 1946, 45, 44, 43, 42, 41
40, 39, 38, 37

37 9 365
38 374 356 X
39 730 365
40 1095 365
41 1460 365 — 24:00
42 1825 365
43 2190 365
44 2555 365
? 45 2920 365
46 3285 365
47 3650
48 missing
49 3650 365
50 4015 365
51 4380
0731 then goes to 9/1
52 4745 365 364 X
53 5109 365
54 5474 365
55 5839 365
56 6204 365
57 6569 365
58 6934 365
59 7299 365
60 7664 365
61 8029

74 12774 365
75 13139 365
76 13504 365
77 13869 365
78 14234 365
79 14599 365
80 14964 365
81 15329 365
82 15694 369 ?? OK
83 16063 369 ?? OK
84 16432 365
18:00 85 16797 365
86 17162 365
87 17527 366 16799 366 OK
88 17893 365 17165
89 18258 365
90 18623 365
91 18988 365
92 19353 365
93 19718 365
94 20083 365
95 20448 365
96 20813 365
97 21178 365
98 21543 X

20813 − 8 = 20805 ÷ 365 = 57 yrs

SAMPLE OUTPUT   5/18/99   1/2

052

PROGRAM MCFO VER. 2.0 (FORTRAN 77)   DAW

$\bar{p}$ = 3.98"
ln $\bar{p}$ = 1.381

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
; 264436 LAS VEGAS WSO AIRPOR
RAINGAGE= 1 264436 LAS VEGAS WSO AIRPORT
YEARS = 57 (SINCE 1937 TO 1993)

$\bar{p}$ from this sample = 4.15"

OCCURRENCE PROCESS
----

57 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW	
642	61	61	33	703	94	— Period 1
666	53	55	24	719	79	— " 2
704	35	38	21	739	59	
727	30	31	10	757	41	
734	27	29	8	761	37	
738	30	26	4	768	30	
731	27	29	11	758	40	
771	11	14	2	782	16	
775	10	8	5	785	13	
715	38	33	12	753	45	
644	64	67	23	708	90	
645	64	63	26	709	89	
698	42	43	15	740	58	
703	38	40	17	741	57	
734	28	27	9	762	36	
714	36	34	14	750	48	
739	26	26	7	765	33	
705	36	39	18	741	57	
693	47	42	16	740	58	
711	37	39	11	748	50	
680	46	44	28	726	72	
697	37	42	22	734	64	
644	61	56	37	705	93	
676	46	50	26	722	76	
652	58	54	34	710	88	
699	65	63	28	764	91	— Period 26

NUMBER OF PARAMETERS CONSIDERED= 7

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.9404 0.25822 -.15658 0.28670E-01 -.33125
-.18767 -.59885E-02
Likelihood Function = -4040.54907

Optimum Parameter Estimates:

-.29829063 0.10628748 -.18562 0.31080 -.44689

Las Vegas

Daw

053

Corresponding Amplitudes:

2.9063	0.32558	0.54435	0.32009

Corresponding Phase Angles:

0.0000	-.60665	-.96311	2.7698

Likelihood Function = -4021.83691

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.93578 0.19246 -.13055 0.11082 -.13521
-.82729E-01 -.47410E-01
Likelihood Function = -925.227295

Optimum Parameter Estimates:

0.91045 0.23493 -.20403 0.15996 -.17063
-.72529E-01 0.62259E-01

Corresponding Amplitudes:

0.91045	0.31115	0.23388	0.95586E-01

Corresponding Phase Angles:

0.0000	-.71512	-.81766	2.4322

Likelihood Function = -923.080200

FINAL LOG LIKELIHOOD FUNCTION: -4944.91699
26; -4944.916990

WORKSHEET

TONOPAH.TXT 5/27/98 ← DAW

58 9 365 ✓
56 374 1460 ✓
60 1834 1460 ✓
64 3294 1460 ✓
68 4754 1460 ✓
72 6214 1460 ✓
76 7674 1460 ✓
80 9134 1460 ✓
84 10594 1460 ✓
88 12054 1429
92 13483 1460 ✓
96 14943

84 10594 365 ✓
85 10959 365 ✓
86 11324 365 ✓
87 11689 365 ✓
88 12054 365 ✓
89 12419 334 - 31 ✓ X
90 12753 365 ✓
91 13118 365 ✓
92 13483

15,338
− 8
15,330 = 42 yrs from 1955

5/28/99 1/2

DAW

$\bar{p} = 6.26''$

$\ln \bar{p} = 1.834$

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 268170 TONOPAH
RAINGAGE= 1 : STATION NUMBER 268170 TONO
YEARS = 42 (SINCE 1955 TO 1996)

$\bar{p}$ from this sample $= 5.32''$

OCCURRENCE PROCESS

42 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
426	59	64	38	485	102
471	48	45	24	519	69
496	35	38	19	531	57
487	43	43	15	530	58
490	41	37	20	531	57
484	36	39	29	520	68
483	43	42	20	526	62
498	33	36	21	531	57
551	14	16	7	565	23
516	29	26	17	545	43
451	50	52	35	501	87
465	54	51	18	519	69
497	34	37	20	531	57
500	33	30	25	533	55
511	30	31	16	541	47
515	27	28	18	542	46
532	24	23	9	556	32
519	26	27	16	545	43
495	36	35	22	531	57
497	39	39	13	536	52
513	31	30	12	544	42
490	37	39	22	527	61
462	44	42	40	506	82
471	49	48	20	520	68
474	39	38	37	513	75
504	49	47	30	553	77

NUMBER OF PARAMETERS CONSIDERED= 7

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.6050 -.58667E-01 -.23233 0.21174E-01 -.14402
-.47759E-01 0.72349E-01
Likelihood Function = -3525.77734

Optimum Parameter Estimates:

2.5834 -.30709E-01 -.20856 0.14625 -.20366
-.15945 0.14712

2/2

DAW Tonopah

056

Corresponding Amplitudes:

2.5834	0.21081	0.25073	0.21695

Corresponding Phase Angles:

0.0000	-1.7170	-.94803	2.3964

Likelihood Function = -3521.00806

4 harmonics -3515.34

7056.0
AIC = -2(-3521.008 - 7) = 7028.02
7048.72 *
AIC = -2(-3515.36 - 9) = 7012.72 *

* MIN

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.59967 0.13792E-02 -.30306E-01 0.45200E-01 -.73495E-01
0.12438 0.30978E-01

Likelihood Function = -1011.80634

4 harmonics -1010.39

DAW 4/2/04

AIC = -2(-1011.8 - 7) = ~~2,009.60~~ 2037.6 * min
AIC = -2(-1010.39 - 9) = ~~2,002.78~~ * ~~min AIC~~ DAW 4/2/04
2,038.78

Optimum Parameter Estimates:

0.56979 0.15363E-01 -.26668E-01 0.11143 -.10498
0.19586 -.10169

Corresponding Amplitudes:

0.56979	0.30777E-01	0.15309	0.22068

Corresponding Phase Angles:

0.0000	-1.0481	-.75559	-.47891

Likelihood Function = -1010.42798

FINAL LOG LIKELIHOOD FUNCTION: -4531.43604
26; -4531.436040

-4525.75

Note: Min AIC for ppo is for 4 harmonics
" " " pio is for 3 "

2nd printout / same data 5/27/99 1/2

: STATION NUMBER 260046 ADAVEN $\bar{p}$ = 12.79" 324.9 mm

057

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .317868 — DAW

FINAL LOG-LIKELIHOOD VALUE=-F= 441.88730

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.24080				
BETA	.85445E-01	.63701E-01	-2.0522	.19907E-01	-2.4440
MEAN	.25822	.49695E-01	-2.7854	.20414E-01	.26296

: STATION NUMBER 260718 BEATTY8N $\bar{p}$ = 6.16" = 156.5 mm BEATTY ~~8N~~ ME .0.1 DAW 4/1/04

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .350336

FINAL LOG-LIKELIHOOD VALUE=-F= 630.17640

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.34495				
BETA	.30627E-01	.19786E-01	-.88589	.15530E-02	2.8120
MEAN	.19229	.32308E-01	3.2380	.39253E-01	1.4996

STATION NUMBER 263285 GOLDFIELD $\bar{p}$ = 6.49" = 164.8 mm

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .355947

FINAL LOG-LIKELIHOOD VALUE=-F= 600.59920

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.34419				
BETA	.50262E-01	.11991E-01	1.8903	.36913E-01	-.11324E-01
MEAN	.20673	.14774E-01	-2.0505	.29507E-01	.39428

: STATION NUMBER 268170 TONOPAH $\bar{p}$ = 5.32" = 135.1 mm

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .322061

FINAL LOG-LIKELIHOOD VALUE=-F= 1708.79700

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.29003				
BETA	.17398E-01	.30058E-02	-4.1570	.67835E-02	-1.7148
MEAN	.16362	.32569E-01	-1.4532	.18968E-01	.51151

264436 LAS VEGAS WSO AIRPORT $\bar{p}$ = 4.15" = 105.4 mm

DAW 5/27/99 1/2

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .328296

FINAL LOG-LIKELIHOOD VALUE=-F= 1119.28100

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.29226				
BETA	.10731E-01	.31424E-02	.77606	.68334E-02	.61722
MEAN	.27777	.20483E-01	-1.8802	.16194E-01	2.5463

: STATION NUMBER 261358 CALIENTE $\bar{p}$ = 8.80" = 223.5 mm

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .213799

FINAL LOG-LIKELIHOOD VALUE=-F= 1648.98400

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.20398				
BETA	.15845E-01	.11005E-01	-.46130	.52284E-02	-.95156
MEAN	.18461	.39613E-01	-2.3523	.17429E-01	.22275

5
0.0080 1301   24 5.990   0 1973
BEATTY8N.OUT

BEATTY8N.PTT

UNIT 19 — Daw — FOR MELSIREV

(See ... .ME)

060

SAL — OFIL — unit 27 — out file — precip file
DAT - PNAME — unit 16 / unit 17 — output file
BOR.1 - ONAME — unit 18
BOR.2 - FNAME — Name

1 - NSTA CORDOBA 0.1000 5 401 44 5.990 0 2 2 2 2 1953

(Thres, LMAXH, NRE, NCOUNT, Screen NLU, MAXH, MAXA, MAXB, MAXT, INIC)

0.0000001 0.00000002 9.99

0.26 0 0

PAREPS, FNEPS, ZMIS

CALFA, NPER, KALFA, NUMSAV

To put in a regional mean α

SAMPLE INPUT FILE

Parameters averaged for
Las Vegas + St. George, UT

AVERAGE PARAMETERS FOR STATION

DAW

0.9284E+00	0.1765E-01	-.5562E+00	0.2285E-01	-.1179E+01
0.1340E-01	-.5669E+00	0.1415E-01	0.9458E-01	0.9728E-02
-.2110E+01	0.2510E-02	0.1652E+01		

P10

0.6541E+00	0.3345E-01	-.8096E+00	0.0000E+00	0.0000E+00
0.2687E-01	-.7619E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00		

BETA

0.3321E-01	0.2026E-01	0.1288E+01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00		

MEAN

0.1576E+00	0.3077E-01	-.2632E+01	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.1410E-01	0.2814E+01	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00		

ALPHA = .31303

PRESS RETURN TO CONTINUE

DAW Goo vs P 1/2

062

Linear Fitting Report

Data File Name: C:\consult\swri\CLIMATE\MCMEPAR.PDW

Model Equation(s):
G00=B+A*PMM

Initial Parameters:

A=	-0.0024775095
B=	3.07017494

Save Options:
Save Data

Number of Function Calls: 2

Parameters After Fitting:

A=	-0.0024775095
B=	3.07017494
SumSqr:	0.073782166
StdDev:	0.067907182

Covariance Matrix:

cvm[1,1]:	0.00003244837
cvm[2,1]:	-0.0060152038
cvm[2,2]:	1.28175111

Goodness of Fit Statistics ...

__ C O D:	0.71940166
__ Corrl:	0.84817549
__ M S C:	0.60416436

Parameter Statistics...

Parameter: A= -0.0024775095

StdDev:	0.00077364580
Coeff. of Variance:	-31.22675346

__95 % Confidence Interval

__ Uninvariant ...

LOW:	-0.0046254945
HIGH:	-0.00032952463

__ Supporting Plane ...

LOW:	-0.0053606814
HIGH:	0.00040566229

Parameter: B= 3.07017494 — DAW $\overline{G_{0}}$ vs $\overline{P}$ 2/2

StdDev: 0.15376148
Coeff. of Variance: 5.00823193

__95 % Confidence Interval

__ Uninvariant ...
LOW: 2.64326466
HIGH: 3.49708522

__ Supporting Plane ...
LOW: 2.49714685
HIGH: 3.64320303

==

----Created by David A. Woolhiser with PSI-Plot
----Fri May 28 09:15:42 1999

==

DAW $\bar{G}_{10}$ vs $\bar{P}$ 1/2

064

Linear Fitting Report

Data File Name: C:\consult\swri\CLIMATE\MCMEPAR.PDW

Model Equation(s):
G10=B+A*PMM

Initial Parameters:

A= -0.0016109222
B= 0.93161567

Save Options:

Save Data

Number of Function Calls: 4

Parameters After Fitting:

A= -0.0016109222
B= 0.93161567

SumSqr: 0.092901455
StdDev: 0.076199350

Covariance Matrix:

cvm[1,1]: 0.00003244837
cvm[2,1]: -0.0060152038
cvm[2,2]: 1.28175111

Goodness of Fit Statistics ...

__ C O D: 0.46261473
__ Corrl: 0.68015787
__ M S C: -0.045626672

Parameter Statistics...

Parameter: A= -0.0016109222

StdDev: 0.00086811594
Coeff. of Variance: -53.88937589

__95 % Confidence Interval

__ Uninvariant ...
LOW: -0.0040211983
HIGH: 0.00079935382

__ Supporting Plane ...
LOW: -0.0048461591
HIGH: 0.0016243147

Parameter: B= 0.93161567 ~~DAW~~ G_{10} vs. $\overline{P}$ 2/4

065

StdDev: 0.17253735
Coeff. of Variance: 18.52022794

__95 % Confidence Interval

__ Uninvariant ...
LOW: 0.45257524
HIGH: 1.41065610

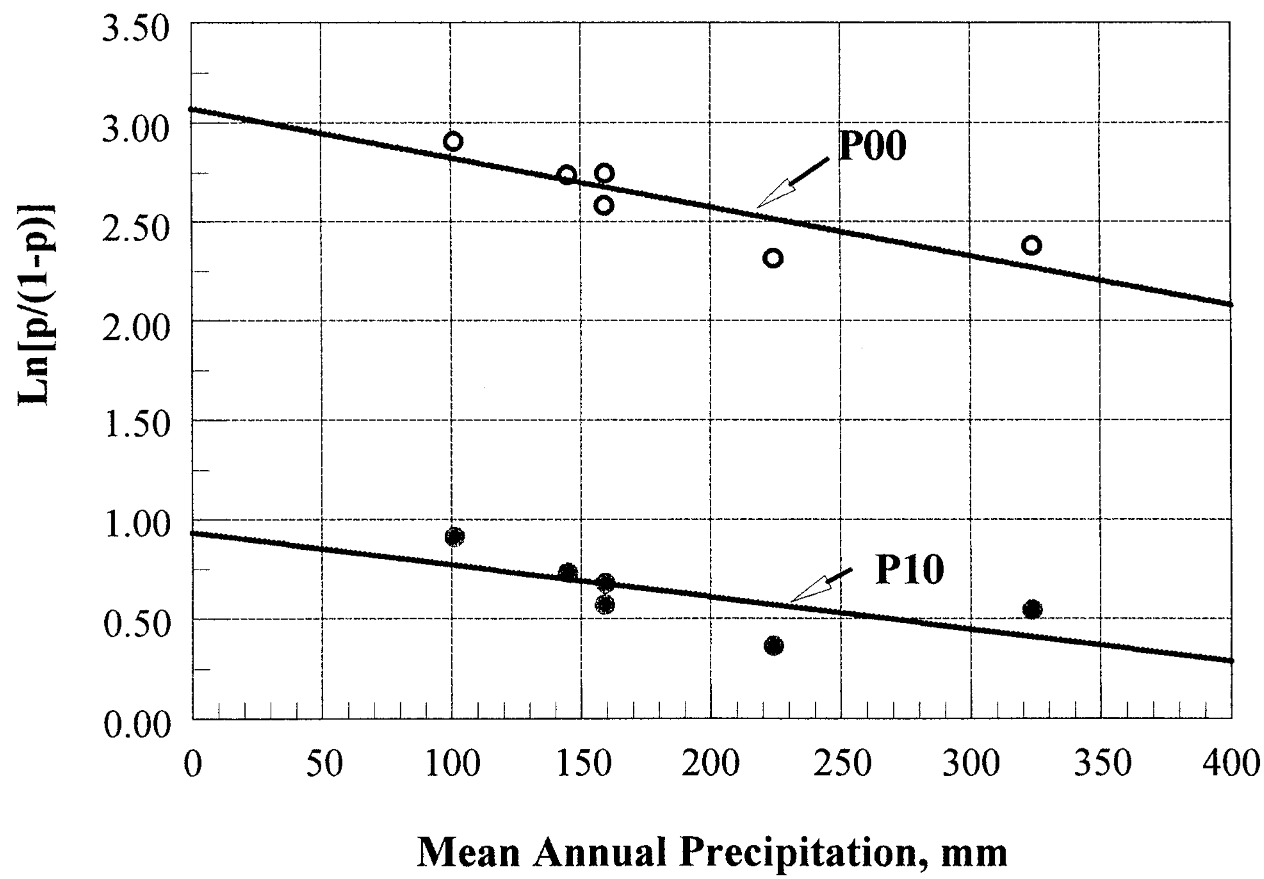
__ Supporting Plane ...
LOW: 0.28861494
HIGH: 1.57461641

==

----Created by David A. Woolhiser with PSI-Plot
----Fri May 28 09:22:05 1999

==

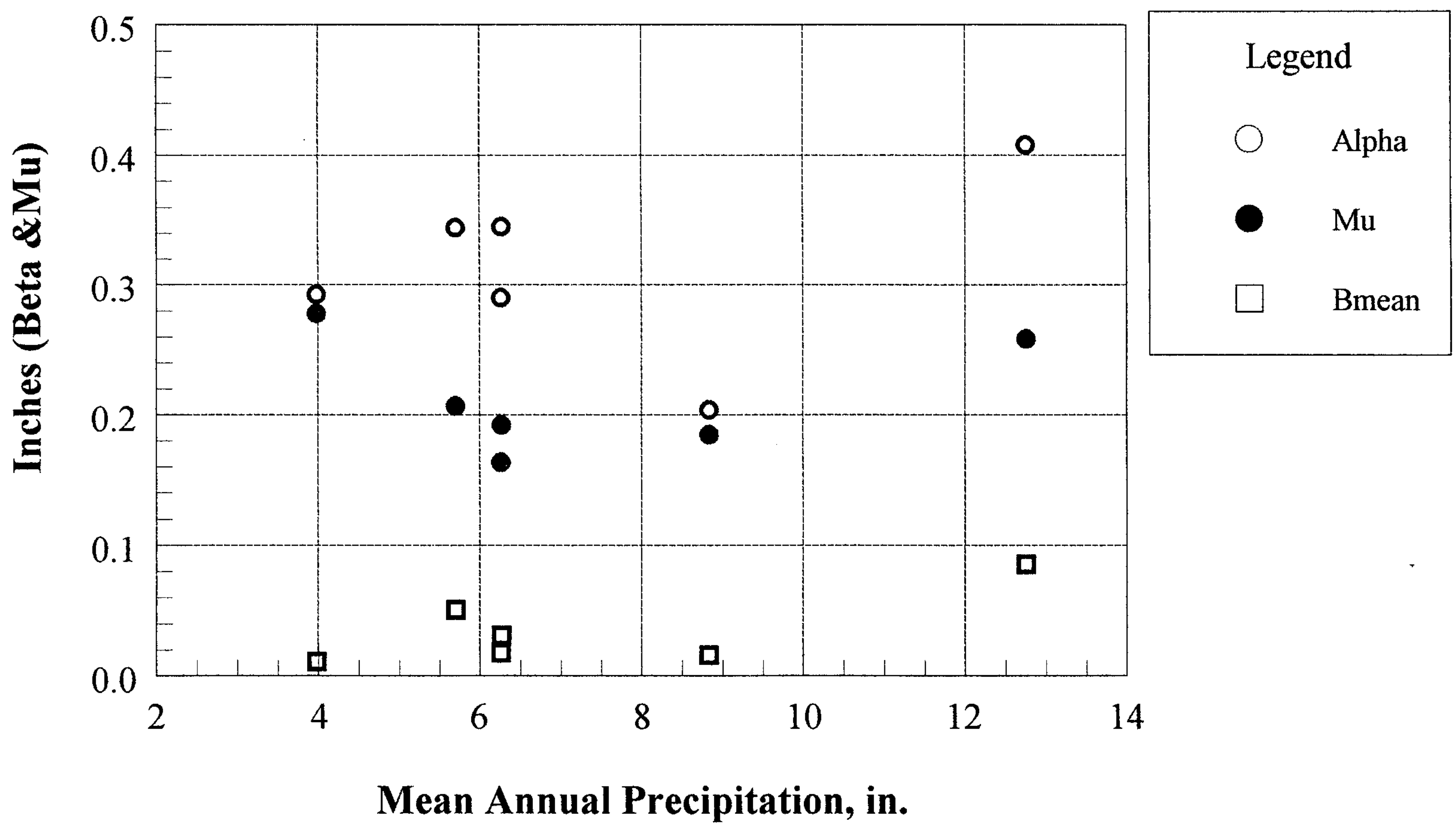
MCMEPAR.PGW
DAW 5/28/99



Relations between the mean logits and Annual Precipitation

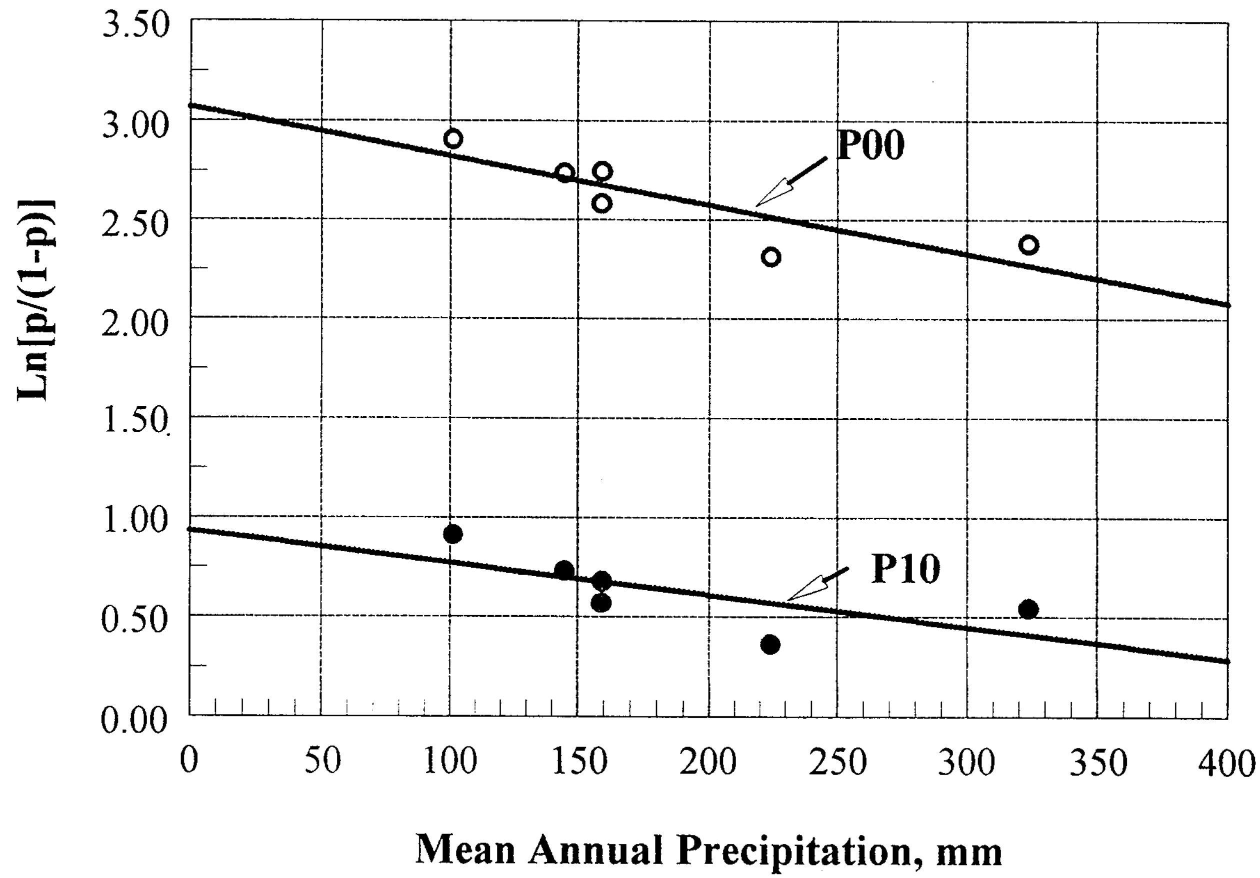
DAW

MEPAR.PGW
DAW 5/28/99



067

MCMEPAR.PGW
DAW 5/28/99



Relations between the mean logits and Annual Precipitation

DAW

C:\CONSULT\SWRI\CLIMATE\THETA.PDW

Station	AnPmm	MUAve	C1	Phi1	C2	Phi2	C3	Phi3
Adaven	324.9000	0.2293	0.0635	-2.6941	0.0204	0.3731	0.0081	-3.2667
Beatty8n	156.5000	0.1843	0.0217	2.9537	0.0241	1.7642	0.0143	0.6063
Goldfield	164.8000	0.1652	0.0402	-1.9533	0.0352	0.6328	0.0559	-3.3626
Tonopah	135.1000	0.1045	0.0303	-1.4535	0.0168	0.4261	0.0054	-3.9021
Las Vegas	105.4000	0.1916	0.0161	-1.9924	0.0187	2.4895	0.0070	-0.5475
Caliente	223.5000	0.2134	0.0360	-2.3082	0.0140	0.2298	0.0011	2.5127

DWW 8/6/99

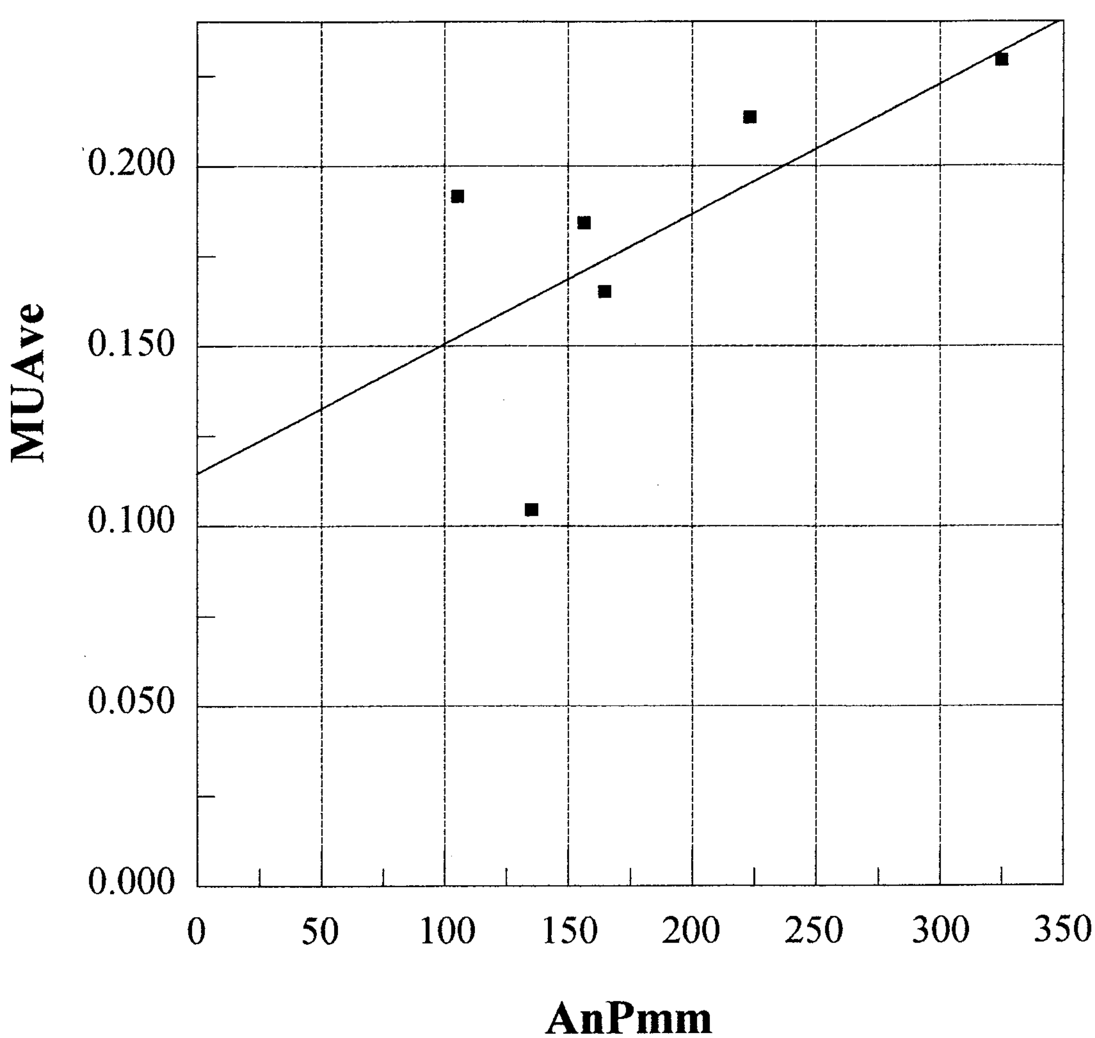
$\bar{u} = 0.1147 + 0.000360 P$ $R = 0.648$ $R^2 = 0.420$

MIXED EXPONENTIAL PARAMETERS

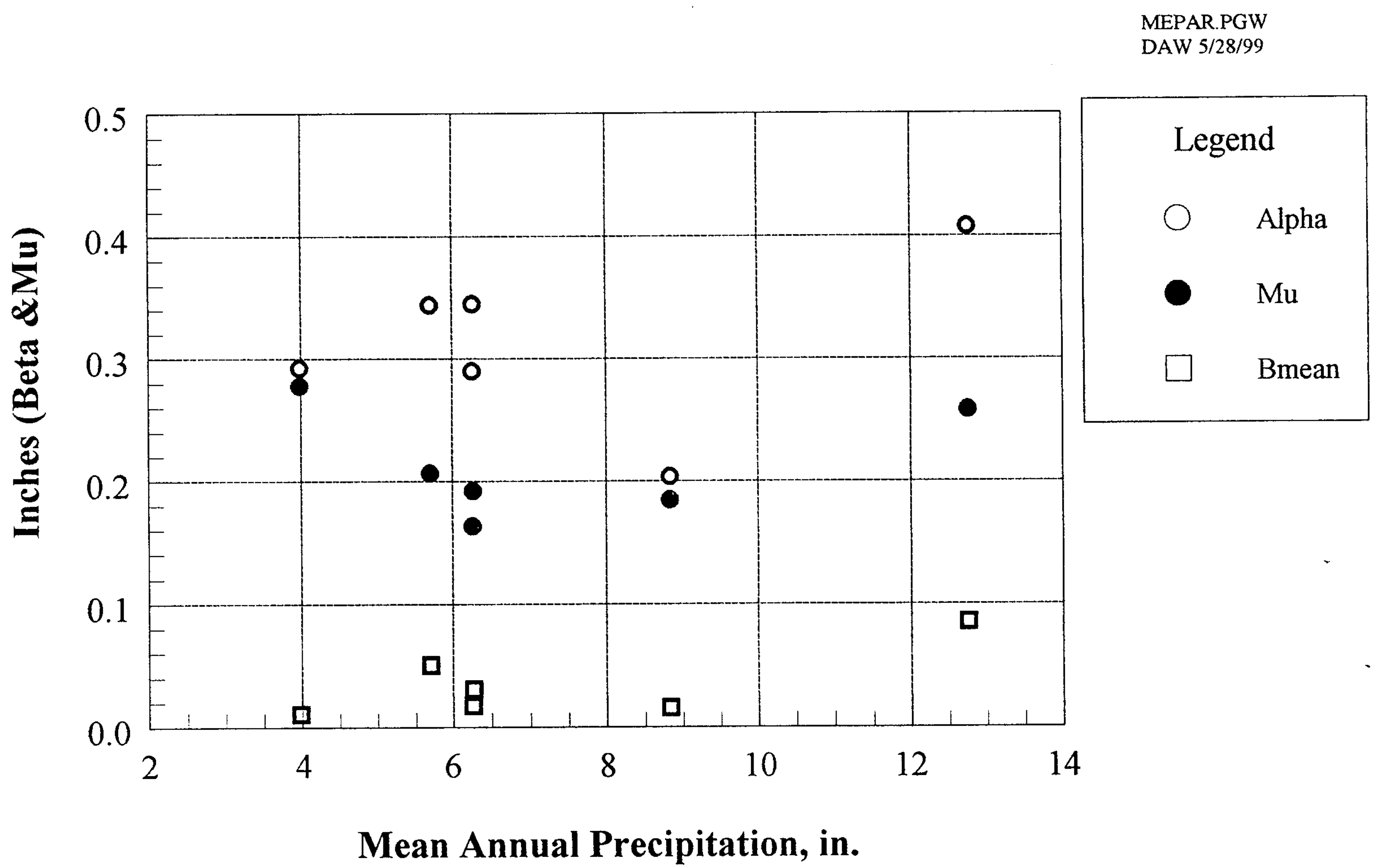
DWW

069

THETA.PDW



MuVSP.pgw DAW 8-6-99


MEPAR.PGW
DAW 5/28/99
Legend
Alpha
Mu
Bmean
Inches (Beta &Mu)
0.5
0.4
0.3
0.2
0.1
0.0
2
4
6
8
10
12
14
Mean Annual Precipitation, in.

PARTIAL PRINTOUT MCFOLR FOR.

DAW DAW 8/3/99

072

```
      PROGRAM MCFO
C
C PROGRAM:   MCFO (MCMELOG)
  VERSION:   2.1
C DATE    :  3, OCT, 1997
C WRITTEN:   DR. WOOLHEISER (MODIFICADO POR GIL), REV. DAW 5/21/99
C LANGUAGE:  FORTRAN 77
C
C   La versi=A2n 2.1 calcula lo mismo que la 2.0 pero para todas las
C estaciones indicadas en la tarjeta y para los 21 per=A1odos
C seleccionados.
C
C DESCRIPTION:
C ------------
C      *
C      *         A FIRST ORDER MARKOV  CHAIN  WITH  TWO  STATES
C      *         IS USED TO DESCRIBE WET AND DRY DAY OCCURRENCE
C      *         THE PROBABILITIES ARE TRANSFORMED TO LOGITS.
C      *         THE PARAMETERS ARE DETERMINED BY USING A NEWTON
C      *         RAPHSON METHOD.
C      *
C      *                           CONSTRAINTS
C      *                           ***********
C      *
C**    *    MAXIMUM NUMBER OF YEARS = 120 (NCOUNT AND NLU)
C      *    MAXIMUM NUMBER OF HARMONICS = (LMAXH) FOR MC.
C      *    MAXIMUM NUMBER IN REAL MATRIX (*B* MATRIX) = 1301 (NRE)
C**    *    MAXIMUM NUMBER OF WET DAYS IN A 14-DAY PERIOD = 1300 (PROGRAM
C      *    WILL STOP *STOP1* AT SUBROUTINE *CALCUL* IF THAT NUMBER IS
C      *    EXCEEDED)
C**    *    MAXIMUM NUMBER OF WET DAYS ON A CALENDAR DAY = 120 (PROGRAM
C      *    WILL STOP *STOP2* AT SUBROUTINE *CALCUL* IF THAT NUMBER IS
C      *    EXCEEDED)
C      *    PROGRAM CAN WORK WITH ONLY ONE STATION AT EACH TIME
C
C ***********************************************************************
C DESCRIPCION DEL FICHERO DE ENTRADA DE DATOS
C
C RECORD 1: PNAME : FICHERO CON LOS DATOS DE PRECIPITACION
C
C RECORD 2: ONAME : FICHERO CON LA SALIDA DE LOS RESULTADOS DE LA
C                   CADENA DE MARKOV DE PRIMER ORDEN.
C
C RECORD 3: NAME  :            A30   NOMBRE DE LA ESTACION
C
C RECORD 4: LMAXH : 00 - 05    I5    NUMERO DE ARMONICOS A CONSIDERAR EN EL
C                                    PROCESO DE OCURRENCIA
C
C RECORD 5: THRES : 00 - 06   F6.4   UMBRAL DE PREC. PARA LOS DIAS LLUVIOSOS
C           NRE   : 07 - 11    I5    NUMERO DE VALORES EN LA MATRIZ REAL
C           NCOUNT: 12 - 16    I5    NUMERO DE A=A5OS EN EL FICHERO A USAR
C           SCREEN: 17 - 22   F6.3   CHI-SQUARE VALUE WITH TWO DEGREES OF
C                                    FREEDOM RECOMMENDED LEVEL = 0.05
C           NLU   : 23 - 27    I4    NUMERO DE A=A5OS DEL FICHERO QUE SE= SALTAN
            INIC  : 28 - 32    I5    PRIMER A=A5O DEL REGISTRO CONSIDERADO
C
C RECORD 7: NPER  : 10 - 11    I2    NUMERO DE PERIODOS (13 o 52)

      INTEGER IHMC
```

```
      COMMON /UNO/PRE(120,365),NCOUNT,THRES,NLU,INIC
      COMMON /DOS/PDD(52),PWD(52),ALFA(52),BETA(52),TETA(52),
     1        DMEAN(52)
      COMMON /SEIS/B(1301),AMP(6,6),PAN(6,6),
     1        MAXH,SCREEN,ALMEAN,BEMEAN,TEMEAN,
     2        XMUMEAN
      COMMON /ONE/NPER,NNPER
      COMMON /OBS52/NDD(52),NWD(52),NDW(52),NWW(52),ND(52),NW(52),
     1              PDD52(52),PWD52(52),PW52(52)
      COMMON /OBS365/N11(365),N21(365),N12(365),N22(365),
     1              N1(365),N2(365),
     1              PDD365(365),PWD365(365),PW365(365)
      COMMON /CNTM/NMD(52),N31(365),NMW(52),N32(365),
     1             NDM(52),N13(365),NWM(52),N23(365),NMM(52),N33(365),
     2             NTD(52),NT1(365),NTW(52),NT2(365),NTM(52),NT3(365),
     3             NMDT,NMWT,NMMT,NDMT,NWMT,NDDT,NWDT,NDWT,NWWT,
     4             MNTM(52),MNAM(52)
      COMMON /PRED52 /TPDD52(52),TPWD52(52),TPW52(52),
     1               TAMT52(52),TDWA52(52)
      COMMON /PRED365/TPDD365(365),TPWD365(365),TPW365(365),
     1               TAMT365(365),TDWA365(365)
      COMMON /MCL/PARMCL(12,4,5),FLIKE(4,5),AMCAMP(0:12,4,5),
     1        AMCPHS(12,4,5)
      COMMON /ALL/LMAXH,LNPER,PHI(12,365)
      LOGICAL COMP
      COMMON /JALG/COMP

      CHARACTER ONAME*30,PNAME*30,NAME*30
      INTEGER NNPP(21),NUMEST

      DATA NNPP/52,40,36,30,26,24,22,21,20,19,18,
     117,16,15,14,13,12,10,8,7,6/

C
C     THE FOLLOWING ARRAYS WERE ADDED TO GENERATE DAILY PRECIPITATION FOR
C     OBSERVED AND PREDICTED.
C


C
C     PROMPT USER FOR INPUT PARAMETER FILE NAME
C     ==================
C
      OPEN(UNIT=19,FILE='TTJJTT',STATUS='OLD')
C     READ INPUT AND OUTPUT FILENAMES FROM PARAMETER FILE
C     ===========================
      READ(19,11,END=4)LMAXH
      READ(19,12,END=4)THRES,NRE,NCOUNT,SCREEN,NLU,INIC
      READ(19,9) ONAME
      OPEN(UNIT=17,FILE=ONAME,STATUS='NEW')
      READ(19,1515)NUMEST
1515  FORMAT(I2)
      DATA NSTA/0001/
      WRITE(17,900)
      III =IFIX(SCREEN)

      IHMC=LMAXH
      IF (IHMC.EQ.0)IHMC=5

      IF(5-III.LT.0)THEN
```

DAW

```
        WRITE(17,52)SCREEN,0.01
      ELSE IF(5-III.EQ.0)THEN
        WRITE(17,52)SCREEN,0.05
      ELSE
        WRITE(17,52)SCREEN,0.1
      ENDIF
C    Begin loop for multiple stations

      DO KKK=1,NUMEST
              READ(19,9) PNAME
              OPEN(UNIT=16,FILE=PNAME,STATUS='OLD')
              IJ  =INIC+NLU
              JI  =IJ+NCOUNT-1




C     READ PRECIPITATION DATA
C     =========================

      READ(16,10,END=4)NAME
      WRITE(17,2222)NAME
2222  FORMAT (' ;',A)
      WRITE(17,40)NSTA,NAME,NCOUNT,IJ,JI

C     NEED TO SKIP FILES
C     ------------------
C     Revision of reading format DAW 5/18/99 TMAX and TMIN read but not used
      IF(NLU.NE.0)THEN
C      DO I=1,NLU
C      READ(16,30)(PRE(I,J),J=1,365)
C      ENDDO
        DO I=1,NLU
                DO J=1,365
                        READ (16,30) PRE(I,J), TMAX, TMIN
                ENDDO
       ENDDO
      ENDIF
C
C     READ PRECIPITATION DATA Revised format by DAW 5/18/99
C     -----------------------
      DO I=1,NCOUNT
        DO J=1,365
C      READ(16,30)(PRE(I,J),J=1,365)
                READ(16,30) PRE(I,J), TMAX, TMIN
        ENDDO
      ENDDO


C      DO IJI=1,21  Took out DO loop on multiple periods, DAW 5/21/99
        IJI=5
```

RUN C2 — DAW 1/2

DAW 8/3/99

TONOPA4.OUT

TONOPAHMC.CON

C 075

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 268170 TONO
RAINGAGE= 1 : STATION NUMBER 268170 TONO
YEARS = 42 (SINCE 1955 TO 1996)

OCCURRENCE PROCESS

---

42 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
426	59	64	38	485	102
471	48	45	24	519	69
496	35	38	19	531	57
487	43	43	15	530	58
490	41	37	20	531	57
484	36	39	29	520	68
483	43	42	20	526	62
498	33	36	21	531	57
551	14	16	7	565	23
516	29	26	17	545	43
451	50	52	35	501	87
465	54	51	18	519	69
497	34	37	20	531	57
500	33	30	25	533	55
511	30	31	16	541	47
515	27	28	18	542	46
532	24	23	9	556	32
519	26	27	16	545	43
495	36	35	22	531	57
497	39	39	13	536	52
513	31	30	12	544	42
490	37	39	22	527	61
462	44	42	40	506	82
471	49	48	20	520	68
474	39	38	37	513	75
504	49	47	30	553	77

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

```
  2.6050      -.58667E-01  -.23233      0.21174E-01  -.14402
-.47759E-01  0.72349E-01  0.88425E-01  -.17559E-01
```

Likelihood Function = -3523.88770

Optimum Parameter Estimates:

```
  2.5885      -.29964E-01  -.21697      0.13916      -.19069
-.17892      0.15912      0.27765      -.24554
```

DAW 2/2

DAW 8/3/99

076

Corresponding Amplitudes:

2.5885	0.21903	0.23607	0.23945	0.37065

Corresponding Phase Angles:

0.0000	-1.7080	-.94035	2.4147	-.72411

Likelihood Function = -3515.36084 * Min AIC

-3521.01 for 3 harmonics

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.59967	0.13792E-02	-.30306E-01	0.45200E-01	-.73495E-01
0.12438	0.30978E-01	0.23033E-01	0.48993E-02	

Likelihood Function = -1011.76678

Optimum Parameter Estimates:

0.57021	0.16128E-01	-.27612E-01	0.10763	-.10456
0.19653	-.10373	0.20052E-01	0.22611E-02	

Corresponding Amplitudes:

0.57021	0.31977E-01	0.15006	0.22222	0.20179E-01

Corresponding Phase Angles:

0.0000	-1.0422	-.77094	-.48563	0.11229

Likelihood Function = -1010.38617

-1010.44 * Min AIC

FINAL LOG LIKELIHOOD FUNCTION: -4525.74707

26; -4525.747070

RUN C3 CALIEN4.OUT 1/2

8/4/99

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

077

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 261358 CALI
RAINGAGE= 1 : STATION NUMBER 261358 CALI
YEARS = 40 (SINCE 1929 TO 1968)

OCCURRENCE PROCESS

40 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
415	43	43	44	458	87
390	58	57	41	448	98
431	41	46	39	472	85
467	39	32	22	506	54
408	49	56	47	457	103
446	44	42	28	490	70
445	46	42	27	491	69
513	16	23	8	529	31
503	23	20	9	526	29
433	47	43	35	480	78
375	69	74	42	444	116
380	65	64	51	445	115
439	45	47	29	484	76
479	32	29	20	511	49
478	28	29	25	506	54
465	30	30	30	495	60
456	37	39	28	493	67
484	28	30	18	512	48
445	44	43	28	489	71
459	36	37	18	495	55
430	38	34	30	468	64
399	52	52	33	451	85
416	55	55	34	471	89
407	59	61	33	466	94
399	61	56	44	460	100
421	66	67	43	487	110

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.3414 0.42186E-02 -.22307 0.12341 -.16401
-.10224 0.52824E-01 0.26403 0.17764
Likelihood Function = -3812.15601

Optimum Parameter Estimates:

2.3243 0.27522E-01 -.22118 0.27726 -.26539
-.24220 0.18315 0.33879 -.12306

Calpin 4. OUT 2/2

078

Corresponding Amplitudes:

2.3243	0.22288	0.38381	0.30365	0.36045

Corresponding Phase Angles:

0.0000	-1.4470	-.76353	2.4941	-.34840

Likelihood Function = -3789.72095 with 4 harmonic - 9
-3805.12 " 3 " - 7

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.38758	0.35862E-01	-.26183E-01	-.15927	-.16506
-.10063E-01	0.38011E-01	0.97160E-02	0.29917E-01	

Likelihood Function = -1324.90662

Optimum Parameter Estimates:

0.36226	0.40061E-02	-.15927E-01	-.98816E-01	-.82958E-01
-.35390E-01	0.43169E-01	-.55079E-01	0.52161E-01	

Corresponding Amplitudes:

0.36226	0.16423E-01	0.12902	0.55821E-01	0.75858E-01

Corresponding Phase Angles:

0.0000	-1.3244	-2.4432	2.2575	2.3834

Likelihood Function = -1323.10815 with 9
-1323.22 with 7

FINAL LOG LIKELIHOOD FUNCTION: -5112.82910
26; -5112.829100

4 harmonic for P_{bc}
3 " for P_{ic}

RUNC4 ADAVEN4.OUT

DAW 8/4/99

DAW

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 260046 ADAV
RAINGAGE= 1 : STATION NUMBER 260046 ADAV
YEARS = 32 (SINCE 1930 TO 1961)

OCCURRENCE PROCESS

32 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
309	50	49	38	359	87
350	37	38	23	387	61
326	47	48	27	373	75
346	44	40	18	390	58
344	33	38	33	377	71
379	29	28	12	408	40
373	29	29	17	402	46
373	30	32	13	403	45
412	16	14	6	428	20
372	30	30	16	402	46
315	52	50	31	367	81
332	41	45	30	373	75
373	28	28	19	401	47
387	24	22	15	411	37
388	26	26	8	414	34
400	20	21	7	420	28
408	18	18	4	426	22
396	19	18	15	415	33
366	32	31	19	398	50
363	32	34	19	395	53
370	33	29	16	403	45
339	39	41	27	378	68
317	41	40	36	358	76
318	41	44	30	359	74
305	46	43	33	351	76
324	52	54	30	376	84

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.3924 -.89921E-01 -.37374 0.12667 -.14657
-.12660 0.31321E-01 0.10195 0.45248E-01
Likelihood Function = -2975.11523

Optimum Parameter Estimates:

-.27703819 0.18683959E-010.20106397 -.10236419 -.25978

ADAVEN4.OUT

Daw

Corresponding Amplitudes:

2.3819	0.36420	0.37052	0.33419	0.22590

Corresponding Phase Angles:

0.0000	-1.6064	-.77698	2.5482	-.47310

Likelihood Function = -2966.36182 for 4 AIC = 5950.72 * min
-2969.66 for 3 AIC = 5953.32

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.57969 0.46737E-02 -.16673 0.14140 -.11991E-01
-.80632E-01 0.48191E-01 0.10286 0.59837E-02
Likelihood Function = -946.595947

Optimum Parameter Estimates:

0.55822 0.53863E-01 -.17164 0.14495 -.79952E-01
-.16200 0.17071 0.24001 -.17099

Corresponding Amplitudes:

0.55822	0.17989	0.16553	0.23534	0.29469

Corresponding Phase Angles:

0.0000	-1.2667	-.50407	2.3300	-.61901

Likelihood Function = -944.853760 AIC = 1907.7
-946.33 for 3 harmonics AIC = 1906.66 * min

FINAL LOG LIKELIHOOD FUNCTION: -3911.21558
26; -3911.215580

Run C5 BEAT3N4.OUT 1/2

DAW 8/4/97

081

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL DAW
;: STATION NUMBER 260718 BEAT
RAINGAGE= 1 : STATION NUMBER 260718 BEAT
YEARS = 24 (SINCE 1973 TO 1996)

OCCURRENCE PROCESS
----

24 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
228	37	36	34	265	70
241	33	37	22	274	59
298	16	16	6	314	22
295	15	17	9	310	26
277	24	22	13	301	35
279	23	23	11	302	34
290	16	17	13	306	30
312	11	11	2	323	13
326	3	5	2	329	7
312	10	8	6	322	14
282	22	23	9	304	32
289	21	19	7	310	26
299	13	16	8	312	24
299	16	14	7	315	21
300	16	15	5	316	20
294	15	17	10	309	27
317	10	9	0	327	9
293	16	18	9	309	27
298	16	15	7	314	22
296	19	18	3	315	21
294	15	16	8	309	24
283	22	21	10	305	31
250	30	28	28	280	56
272	24	26	14	296	40
253	31	28	22	284	50
282	28	29	15	310	44

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.7957 0.10169 -.44087 -.88447E-01 -.27936
0.41542E-01 0.14732 0.12658 -.20314E-01
Likelihood Function = -1845.98596

Optimum Parameter Estimates:

2.7511 0.15088 -.46171 0.92034E-01 -.27592
-.94573E-01 0.14676 0.28712 -.27541

Corresponding Amplitudes:

2.7511	0.48574	0.29087	0.17459	0.39786

Corresponding Phase Angles:

0.0000	-1.2549	-1.2489	2.1432	-.76458

Likelihood Function = -1837.15564 * Min AIC
-1840.30 for 3 harmonics

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

0.87648	-.29210	-.43405	0.29549	-.10890
0.37111E-01	0.23426	-.96922E-01	-.17861	

Likelihood Function = -514.907898

Optimum Parameter Estimates:

0.67330	-.28762E-01	-.25101	0.13162	-.14812
0.13256	-.24163E-01	-.77544E-01	0.51912E-01	

Corresponding Amplitudes:

0.67330	0.25265	0.19815	0.13475	0.93316E-01

Corresponding Phase Angles:

0.0000	-1.6849	-.84431	-.18030	2.5517

Likelihood Function = -505.952240
-506.03 * Min AIC - 3 harmonics

FINAL LOG LIKELIHOOD FUNCTION: -2343.10791

26; -2343.107910

RUNCG GOLD4.OUT 1/2

DAW 8/4/99 083

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
;: STATION NUMBER 263285 GOLD
RAINGAGE= 1 : STATION NUMBER 263285 GOLD
YEARS = 28 (SINCE 1949 TO 1976)

OCCURRENCE PROCESS

28 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
287	38	43	18	325	61
308	30	30	13	338	43
330	25	25	9	355	34
325	29	29	9	354	38
326	29	27	9	355	36
314	26	32	16	340	48
338	22	20	10	360	30
342	17	17	16	359	33
362	11	14	5	373	19
344	18	18	12	362	30
315	30	27	20	345	47
340	21	24	7	361	31
335	23	23	11	358	34
344	19	18	11	363	29
349	20	17	6	369	23
368	9	12	3	377	15
370	9	11	2	379	13
343	17	15	10	360	25
337	17	17	7	354	24
330	18	17	8	348	25
322	17	14	9	339	23
314	22	24	4	336	28
312	25	30	22	337	52
318	29	27	15	347	42
320	23	24	22	343	46
327	36	32	14	363	46

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.7574 -.18822 -.38450 0.41663E-01 -.15516
-.66721E-01 0.90660E-01 0.61647E-01 -.44093E-01
Likelihood Function = -2139.95459

Optimum Parameter Estimates:

2.7418 -.10657 -.34767 0.14350 -.21882
-.20408 0.20483 0.25967 -.25412

GOLD4.OUT

Corresponding Amplitudes:

2.7418	0.36363	0.26168	0.28914	0.36333

Corresponding Phase Angles:

0.0000	-1.8682	-.99035	2.3544	-.77460

Likelihood Function = -2134.30225 * min AIC
-2137.36 with 3

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

```
 0.80254      -.82429E-01  -.52035E-01  0.25086      0.77472E-01
0.63243E-02  -.72870E-01  0.21155E-01  -.81634E-01
Likelihood Function = -551.649963
```

Optimum Parameter Estimates:

```
 0.73884      -.40275E-01  0.95444E-02  0.28077      -.29131E-01
0.17062      -.18365      0.13994      -.11812
```

Corresponding Amplitudes:

0.73884	0.41390E-01	0.28228	0.25068	0.18313

Corresponding Phase Angles:

0.0000	2.9089	-.10338	-.82215	-.70106

Likelihood Function = -549.572693
-549.85 with 3 * min AIC

FINAL LOG LIKELIHOOD FUNCTION: -2683.87500
26; -2683.875000

Run C7 VEGAS4.OUT

1/2

PROGRAM MCFO VER. 2.0 (FORTRAN 77)

DAW 8/4/99

DAW

085

SCREEN = 5.990 WHICH IS THE 0.05 SIGNIFICANCE LEVEL
; 264436 LAS VEGAS WSO AIRPOR
RAINGAGE= 1 264436 LAS VEGAS WSO AIRPOR
YEARS = 57 (SINCE 1937 TO 1993)

OCCURRENCE PROCESS

---

57 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

NDD	NDW	NWD	NWW	ND	NW
642	61	61	33	703	94
666	53	55	24	719	79
704	35	38	21	739	59
727	30	31	10	757	41
734	27	29	8	761	37
738	30	26	4	768	30
731	27	29	11	758	40
771	11	14	2	782	16
775	10	8	5	785	13
715	38	33	12	753	45
644	64	67	23	708	90
645	64	63	26	709	89
698	42	43	15	740	58
703	38	40	17	741	57
/34	28	27	9	762	36
714	36	34	14	750	48
739	26	26	7	765	33
705	36	39	18	741	57
693	47	42	16	740	58
711	37	39	11	748	50
680	46	44	28	726	72
697	37	42	22	734	64
644	61	56	37	705	93
676	46	50	26	722	76
652	58	54	34	710	88
699	65	63	28	764	91

NUMBER OF PARAMETERS CONSIDERED= 9

DRY-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

2.9404 0.25822 -.15658 0.28670E-01 -.33125
-.18767 -.59885E-02 0.20679 0.86812E-01
Likelihood Function = -4037.90723

Optimum Parameter Estimates:

2.9128 0.26963 -.20514 0.27957 -.42625
-.32329 0.14635 0.29557 -.15758

VEGAS4.OUT

Corresponding Amplitudes:

2.9128	0.33880	0.50975	0.35487	0.33495

Corresponding Phase Angles:

0.0000	-.65039	-.99029	2.7165	-.48979

Likelihood Function = -4013.51318 * min AIC
-4021.84 for 3 harmonics

WET-DRY SITUATION:

Number of Periods= 26

Initial Parameter Estimates:

```
 0.93578      0.19246      -.13055      0.11082      -.13521
-.82729E-01  -.47410E-01  -.40004E-01  0.41874E-01
Likelihood Function = -924.843628
```

Optimum Parameter Estimates:

```
 0.90554      0.23128      -.18748      0.17627      -.18538
-.52110E-01  0.23725E-01  -.17913      0.16474
```

Corresponding Amplitudes:

0.90554	0.29772	0.25580	0.57257E-01	0.24337

Corresponding Phase Angles:

0.0000	-.68118	-.81057	2.7144	2.3980

Likelihood Function = -922.343994
-923.08 for 3 harmonics * min AIC

FINAL LOG LIKELIHOOD FUNCTION: -4935.85742
26; -4935.857420

CNWRA	Future Climate	DAW 8/3/99	1

Rerum the mixed exponential analysis with α = a regional constant.

087

~~DAW~~

Average α from 6 stations

First check to see if more harmonics are appropriate (i.e. lead to a lower Akaike Information Criterion (AIC)

Ran Caliente with 4 harmonics – 2 harmonics gave a lower AIC for Mixed exponential. 40 yrs

Try Caliente with 3 harmonics – 2 harmonics still gives minimum AIC

Run C2 – Tonopah with 4 harmonics MC { 4 harmonics p_{00} Min AIC; 3 " p_{10} " " }

8/4/99 Continue computer runs wit MCFOIR.

Run C3 – Caliente 4 harmonics give lowest AIC for p_{00}
3 " " " " for p_{10}

Run C4 – Adaven 4 harmonics for p_{00}
3 " for p_{10}

Run C5 – BEATTY8N 4 harmonics for p_{00}
3 " for p_{10}

Run C6 – GOLDFIELD "

Run C7 – Las Vegas "

CONCLUSION: Require 4 harmonics for p_{00} } all stations
" 3 " " p_{10}

Now make computer runs with ~~AAES~~ DAW 4/1/04 MELSIREV – 3 harmonics

Run C8 – Las Vegas	3 harmonics – minimum AIC		40 yrs
Run C9 – Adaven	3 harmonics – min. AIC		32 "
Run C10 – BEatty8N	2 harmonics – min AIC		24 "
Run C11 – Goldfield	3 harmonics – min AIC		28 "
Run C12 – Tonopah	2 harmonics – min. AIC		42 "

CONCLUSION: 3 have 3 harmonics, 3 have 2 harmonics. Not directly related to record length. For consistency use the 3 harmonic cases to get an average α.

Set up a spreadsheet for each parameter estimated as a Fourier Series. Use

1. G_{00} G00.PDW four harmonics ✓ — DAW
2. G_{10} G10.PDW three harmonics (088
3. β + α ALBETA.PDW Three harmonics $\bar{\alpha} = 0.298$
4. ~~Theta~~ μ DAW 8/4/99 ~~THETA~~ MU.PDW Three harmonics (α variable)
5. β with α constant

Col. 1 Col. 2.

Station An. Precip (mm)

6. MU.PDW with α constant.

8/6/99

Complete 6 runs with $\bar{\alpha} = 0.298$

Attempted runs with α input. The revisions in Spain seem to have created a problem with this option – no results for 2 stations (Runs C13 + C14)

Entered data in spreadsheets G10.PDW and ALBETA.PDW.

Findings:

1. There is a weak correlation between $\ln\left(\frac{\alpha}{1-\alpha}\right)$ and mean annual P. $R = 0.356$ $R^2 = 0.127$

$\ln\left(\frac{\alpha}{1-\alpha}\right) = -0.5695 - 0.00168$

2. There is a stronger correlation between β mean and annual P. $R = 0.723$ $R^2 = 0.522$

$\bar{\beta} = -0.01534 + 0.000286\,\bar{P}$ (β in inches, $\bar{P}$ in mm!)

$= -0.3896 + 0.0073\,\bar{P}$ (β in mm ")

(Gradient in Idaho was 0.0021 so there is a stronger relation in Nevada.

Partial Printout of MELSIREV
Daw 8/6/99
DAW


```
      PROGRAM MCMELOG
C
C PROGRAM:   MELSI (MCMELOG + AGUA53)
  'ERSION:   2.0
C DATE   :   16, OCT, 1997
C WRITTEN:   DR. WOOLHEISER (MODIFICADO POR GIL) Rev. by DAW 5/21/99
C LANGUAGE:  FORTRAN 77
C
C DESCRIPTION:
C ------------
C      *
C      *        A MIXED EXPONENTIAL DISTRIBUTION  IS  USED  TO
C      *        DESCRIBE  THE  PRECIPITATION DEPTH ON WET DAYS.
C      *        THE SIMPLEX METHOD IS USED TO OPTIMIZE PARAMETERS.
C      *        LA OPTIMIZACION QUE SE REALIZA ES SIMULTANEA.
C      *
C      *                             CONSTRAINTS
C      *                             ***********
C      *
C**    *   MAXIMUM NUMBER OF YEARS = 50 (NCOUNT AND NLU)
C      *   MAXIMUM NUMBER OF HARMONICS = 6(MAXH AND MAXH1) FOR MIX-EXP
C      *   MAXIMUM NUMBER IN REAL MATRIX (*B* MATRIX) = 1301 (NRE)
C**    *   MAXIMUM NUMBER OF WET DAYS IN A 14-DAY PERIOD = 1300 (PROGRAM
C      *   WILL STOP *STOP1* AT SUBROUTINE *CALCUL* IF THAT NUMBER IS
C      *   EXCEEDED)
C**    *   MAXIMUM NUMBER OF WET DAYS ON A CALENDAR DAY = 120 (PROGRAM
C      *   WILL STOP *STOP2* AT SUBROUTINE *CALCUL* IF THAT NUMBER IS
C      *   EXCEEDED)
C      *   PROGRAM CAN WORK WITH ONLY ONE STATION AT EACH TIME

      REAL*8 PAREPS,FNEPS
      INTEGER IHMC
      COMMON/UNO/PRE(50,365),NCOUNT,THRES,NLU,INIC,NUMSAV,MOR(26)
      COMMON/DOS/PDD(26),PWD(26),ALFA(26),BETA(26),TETA(26),DIB(26),
     1        DMEAN(26)
      COMMON/NUEVE/ALF1(365),BET1(365),TET1(365),UNITX,AMAX,AMIN,BMIN,
     1        TMIN,QLIKX,NCX(6,3),NC1X(6,3),XMU(365)
      COMMON/SEIS/B(1301),SENO(6,365),COSE(6,365),AMP(6,6),PAN(6,6),
     1         MAXH,SCREEN,ALMEAN,BEMEAN,TEMEAN,MAXA,MAXB,MAXT,CALFA,
     2         KALFA,XMUMEAN
      COMMON/OCHO/PR(50,1300),MX(26),LX(365),MM,IPER,ORMOM1(26),
     1                          MSD(26)
      COMMON/DIEZ/SECO(53),HUM(53),PLO(53),PAR1(53),PAR2(53),PAR3(53),
     1         ZMEDIA(53)
      COMMON/ONE/NPER,NNPER,PAREPS,FNEPS,ZMIS
      COMMON/PRED365/TPDD365(365),TPWD365(365),TPW365(365),
     1                TAMT365(365),TDWA365(365)
      COMMON/ACCUM26/ACOBSNU(26),ACPRENU(26),ACOBSAM(26),ACPREAM(26),
     1                ACOBSMS(26)
      COMMON/ALL/LMAXH,LNPER,PHI(12,365)
      CHARACTER FNAME*30,INAME*30,ONAME*30,PNAME*30,NAME*30,
     1           ZL(9)*4, OFIL*30

C
      THE FOLLOWING ARRAYS WERE ADDED TO GENERATE DAILY PRECIPITATION FOR
C     OBSERVED AND PREDICTED.
C

      DATA CALFA/0./,KALFA,NUMSAV/2*0/
```

21
3

DAW 0 090

```
      DATA ZL/' P00',' P10','ALFA ','BETA','TETA','DAYS','MEAN',
     1     'AMTS','WET '/

C     PROMPT USER FOR INPUT PARAMETER FILE NAME
C     ===================
      INAME='TTJJTT'
C
      OPEN(UNIT=19,FILE=INAME,STATUS='OLD')
C     READ INPUT AND OUTPUT FILENAMES FROM PARAMETER FILE
C     ===========================
      READ(19,9) OFIL
      READ(19,9) PNAME
      READ(19,9) ONAME
      READ(19,9) FNAME
      OPEN(UNIT=27,FILE=OFIL,STATUS='UNKNOWN')
      OPEN(UNIT=16,FILE=PNAME,STATUS='OLD')
      OPEN(UNIT=17,FILE=ONAME,STATUS='NEW')
      OPEN(18,FILE=FNAME,STATUS='NEW')
C
C     READ PROCESSING PARAMETERS
C     ===========================
      READ(19,10,END=4)NSTA,NAME,THRES,LMAXH,NRE,NCOUNT,SCREEN,NLU,
     1 MAXH1,MAXA,MAXB,MAXT,INIC
C
C
C
C NOTES:
C      WE HAVE FOUND THAT PAREPS=.00001 & FNEPS=.000002 SEEM TO GIVE
C      GOOD RESULTS. (DAW 9-5-86)
C
C      FOR WALNUT GULCH, AZ, THE FUNCTION WAS VERY FLAT AND THE
C      OPTIMIZATION WOULD CONVERGE ON THE FUNCTION ONLY, UNTIL
C      THE ASIMPLX WAS MODIFIED SO THAT BOTH THE FUNCTION AND THE
C      PARAMETER CRITIRIA FOR TOLERANCE WAS MET DURING OPTIMIZATION.
C
C      ---------------------------------------------------------------------
C
C
      WRITE(17,900)
      READ (19,*)PAREPS,FNEPS,ZMIS
      WRITE(17,690)PAREPS,FNEPS,ZMIS
      READ (19,700)CALFA,NPER,KALFA,NUMSAV
      WRITE(17,731)NPER
```

Daw 3/3

091

```
C       FORMATS
C       -------
9       FORMAT(A)
        FORMAT(I4,A,F6.4,3I5,F6.3,2I4,3I2,I5)
[illegible] FORMAT(F6.2, 2X,F6.0,2X,F6.0)
25      FORMAT(//,' DISTRIBUTION OF PRECIPITATION DEPTH',/
     1         ' -----------------------------------',//)
35      FORMAT(1H1)
40      FORMAT(' RAINGAGE=',I5,2X,A30,/
     1        ' YEARS   =',I5,2X,'(SINCE',1X,I5,2X,'TO',1X,I5,')')
50      FORMAT(' WET DAY THRESHOLD   =',F6.4/
     1        ' TABLE OF REAL VALUES=',I5/
     1        ' HARMS(MARKOV)       =',I2/
     1        ' HARMS(MIX.EXP)      =',I2)
52      FORMAT(' SCREEN =',F6.3,2X,'WHICH IS THE',F5.2,
     1       ' SIGNIFICANCE LEVEL')
690     FORMAT(' PARAMETER CONVERGENCE TOLERANCE = 'G12.5,/,
     1        ' FUNCTION CONVERGENCE TOLERANCE  = 'G12.5,/,/,
     2        ' MISSING PRECIPITATION CODE = 'G12.5)
700     FORMAT(F9.0,3I2)
710     FORMAT(' CONSTANT VALUE FOR ALFA HAS BEEN INPUTTED ',5X,
     1 'INPUT VALUE = 'F8.4,' ONLY BETA AND TETA WILL BE OPTIMIZED')
720     FORMAT(' CONSTANT ALFA WILL BE OBTAINED FROM THE MEANS OF '
     1       'ALFAS OPTIMIZED OVER 26 BIWEEKLY PERIODS')
725     FORMAT(1X,8I5)
730     FORMAT(1X,I5,' PERIODS WILL BE SAVED '/,5X,'THEY ARE:'(10I5))
731     FORMAT(' NUMBER OF PERIODS CONSIDERED IN ANALYSIS = ',I2)
770     FORMAT(/' OBSERVED NUMBER OF ACCUMULATED WET DAYS'/)
[illegible] FORMAT(/' THEORETICAL NUMBER OF ACCUMULATED WET DAYS'/)
[illegible] FORMAT(/' OBSERVED NUMBER OF ACCUMULATED MISSING DAYS'/)
800     FORMAT(/' OBSERVED ACCUMULATED PRECIPITATION DEPTH PER ',
     1       I2, '-DAY PERIODS'/)
810     FORMAT(10X,13F8.2)
820     FORMAT(/' THEORETICAL ACCUMULATED PRECIPITATION DEPTH PER ',
     1       I2,'-DAY PERIODS'/)
830     FORMAT('1COMPUTED PARAMETER VALUES'/
     1        ' -------------------------'//)
831     FORMAT(' PARAMETER',4X,'MEAN',2(10X,'AMP',10X,'PAN'))
832     FORMAT(/,3X,A,3X,G12.5,(T26,8(G12.5,1X)))
C833     FORMAT(/,1X,A,F10.6)
900     FORMAT('1'/ ' -------------------------------------'/
```

TTJJTT for mixed ...

Dave

092

CALIEME.O1
CALIENTE.PTT
CALIEME.O2
LIEME.O3
1 CALIENTE 0.0080 ' 2 401 40 5.990 0 2 0 2 2 1929
0.0000001 0.00000002 9.99
0.26 0 0

1/1

DAW 8/3/99

RUN # C1 — DAW CALIEME.CON

: STATION NUMBER 261358 CALI 4 harmonics 093

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .213799

FINAL LOG-LIKELIHOOD VALUE=-F= 1649.58100

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.19191				
BETA	.14011E-01	.10685E-01	-.35809	.57319E-02	-1.4164
.28202E-02	2.0365	.18590E-02	-.54420E-01		
MEAN	.15435	.38497E-01	-2.3368	.16049E-01	.20036
.98617E-03	2.4613	.90649E-02	-3.1416		

Note: Akaike Information Criterion AIC = -2 log(max likelihood) + 2 m

where m = number of parameters

			AIC
For 26 periods, 3 parameters/period	m = 78	ML = 1691.31	-3226.63
For 1 par for α, 9 parameters each for β + μ	m = 19	ML = 1649.58	-3261.16
For 1 par for α, 5 parameters each for β + μ	m = 11	ML = 1648.98	-3275.96 *

MIN. AIC is for 2 harmonics for β + μ

For 1 par for α 7 parameters each for β + m	m = 15	ML = 1649.55	-3269.10

DAW 8/13/99 1/1

: STATION NUMBER 261358   CALIENTE 3 harmonics

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR =   .213799 DAW   094

FINAL LOG-LIKELIHOOD VALUE=-F= 1649.55900

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.18590				
BETA	.13123E-01	.90114E-02	-.42364	.66599E-02	-1.4855
	.22477E-02	1.5933			
MEAN	.21343	.35974E-01	-2.3082	.14024E-01	.22980
	.11437E-02	2.5127			

Run # C8 DAW VEGASME.04

264436 LAS VEGAS WSO AIRPOR

DAW 8/14/99

1/1

095

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .328296

FINAL LOG-LIKELIHOOD VALUE=-F= 1127.32200 for 3 - min AIC
1119.28 for 2 harmonics

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.28203				
BETA	.97436E-02	.37570E-02	.80341	.65693E-02	1.0253
	.47770E-02	.25259			
MEAN	.19160	.16148E-01	-1.9924	.18710E-01	2.4895
	.70230E-02	-.54753			

RUN # C9 ADAV3ME.04

: STATION NUMBER 260046 ADAV DAW

DAW 8/14/99

096

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .317868

FINAL LOG-LIKELIHOOD VALUE=-F= 446.55910 * Min AIC
441.89 for 2 harmonics

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.26983				
BETA	.88066E-01	.42300E-01	-1.6823	.10282E-01	-2.1371
	.64334E-01	1.1824			
MEAN	.22935	.63529E-01	-2.6941	.20371E-01	.37309
	.80856E-02	-3.2667			

RUN C10 DAW 8/4/00

1/1

: STATION NUMBER 260718 BEATTY8N BEAT3ME.04

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .350336 DAW 097

FINAL LOG-LIKELIHOOD VALUE=-F= 631.07320

630.18 with 2 harmonics & min AIC

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.35344				
BETA	.36569E-01	.16671E-01	-.58350	.14594E-01	2.5251
	.12038E-01	-3.4876			
MEAN	.18434	.21729E-01	2.9537	.24144E-01	1.7642
	.14274E-01	.60635			

RUN C11 GOLD3ME.04

: STATION NUMBER 263285 GOLDFIELD

DAW DAW 8/4/99

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .355947

098

FINAL LOG-LIKELIHOOD VALUE=-F⇒ 614.06380 * min AIC

600.60 for 2 harmonics

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.40497				
BETA	.60929E-01	.12924E-01	1.1661	.27927E-01	-.27251E-01
	.18533E-01	.62237			
MEAN	.16520	.40235E-01	-1.9533	.35153E-01	.63275
	.55931E-01	-3.3626			

RUN # C.12 TONO3ME.04

: STATION NUMBER 268170 TONOPAH ——— DAWSON 8/4/99

C 099

VALOR MEDIO DE ALFA ANTES DE OPTIMIZAR = .322061

FINAL LOG-LIKELIHOOD VALUE=-F= 1709.63500
1708.80 with 2 harmonics * Min AIC

PARAMETER	MEAN	AMP	PAN	AMP	PAN
ALFA	.29153				
BETA	.17381E-01	.71402E-02	-4.3429	.75322E-02	-2.1360
	.71435E-02	-1.0172			
MEAN	.10451	.30350E-01	-1.4535	.16841E-01	.42614
	.54533E-02	-3.9021			

Daw

1/3

===

Linear Fitting Report

Data File Name: C:\consult\swri\CLIMATE\G00.PDW

100

===

Model Equation(s):
MEAN=B+A*ANPMM

Initial Parameters:

A=	-0.0023351788
B=	3.04881925

Save Options:

Number of Function Calls: 9

Parameters After Fitting:

A=	-0.0023351788
B=	3.04881925
SumSqr:	0.093218556
StdDev:	0.076329285

Covariance Matrix:

cvm[1,1]:	0.00003215360
cvm[2,1]:	-0.0059494884
cvm[2,2]:	1.26752034

Goodness of Fit Statistics ...

__ C O D:	0.64530410
__ Corrl:	0.80330822
__ M S C:	0.36982782

Parameter Statistics...

Parameter: A= -0.0023351788

StdDev:	0.00086563740
Coeff. of Variance:	-37.06942702

__95 % Confidence Interval

__ Uninvariant ...

LOW:	-0.0047385734
HIGH:	0.00006821574

__ Supporting Plane ...

LOW:	-0.0055611789
HIGH:	0.00089082125

Parameter: B= 3.04881925

DAW

2/7

StdDev: 0.17186944
Coeff. of Variance: 5.63724589

_95 % Confidence Interval

__ Uninvariant ...
LOW: 2.57163323
HIGH: 3.52600527

__ Supporting Plane ...
LOW: 2.40830763
HIGH: 3.68933087

==

----Created by D. A. Woolhiser with ProStat
----Wed Aug 04 16:29:04 1999

==

C1 - no correlation

ϕ_1 - R^2 = .166 R = .407 $\phi_1 = -1.008 - 0.00224 \bar{P}$

C_2 - no correlation n.s.

ϕ_2 - R^2 = .386 R = .621 $\phi_2 = -1.21 + .001396 \bar{P}$

C_3 - n.s.

ϕ_3 - n.s

C_4 - R^2 = 0.598, R = .773, $C_4 = 0.4518 - 0.000592 \bar{P}$

ϕ_4 - R^2 = 0.214, R = 0.463 $\phi_4 = -0.792 + 0.00106 \bar{P}$

Dan?

1/1

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==

Column Information Report

Data File Name: C:\consult\swri\CLIMATE\G00.PDW

==

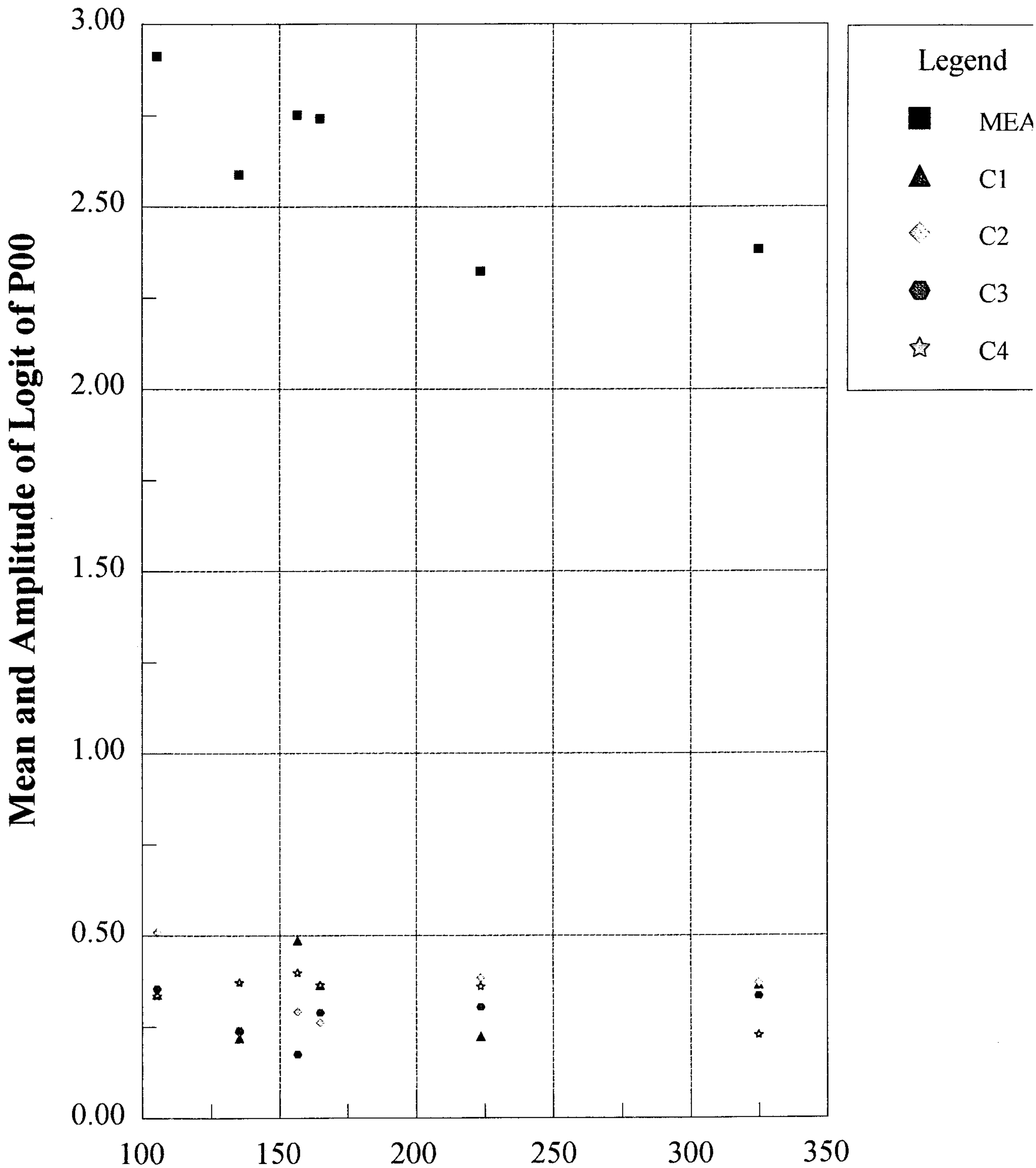
Current Sheet Name:	C:\CONSULT\SWRI\CLIMATE\G00.PDW
Number of Columns:	11
Current Column Index:	2
Current Column Name:	ANPMM – mean annual precip.
Number of Points:	6
Current Column Type:	Number
Maximum Value:	324.90000000
Minimum Value:	105.40000000
Sum of Column:	1110.20000000
Mean Value:	185.03333333
Number of Missing Points:	0

==

----Created by D. A. Woolhiser with ProStat
----Wed Aug 04 16:13:20 1999

==

G00.PDW


3.00
2.50
2.00
1.50
1.00
0.50
0.00
Mean and Amplitude of Logit of P00
100
150
200
250
300
350
Legend
MEA
C1
C2
C3
C4

DAW DAW 8/5/99

Column Information Report

Data File Name: C:\CONSULT\SWRI\CLIMATE\ALBETA.PDW

Current Sheet Name:	C:\CONSULT\SWRI\CLIMATE\ALBETA.PDW
Number of Columns:	3
Current Column Index:	3
Current Column Name:	ALPHA
Number of Points:	6
Current Column Type:	Number
Maximum Value:	0.40497000
Minimum Value:	0.18590000
Sum of Column:	1.78770000
Mean Value:	0.29795000
Number of Missing Points:	0

----Created by D. A. Woolhiser with ProStat
----Thu Aug 05 11:14:33 1999

These are from the α values obtained from runs C8-C12 and an unnumbered run for Caliente. All were run with 3 harmonics for β and μ.

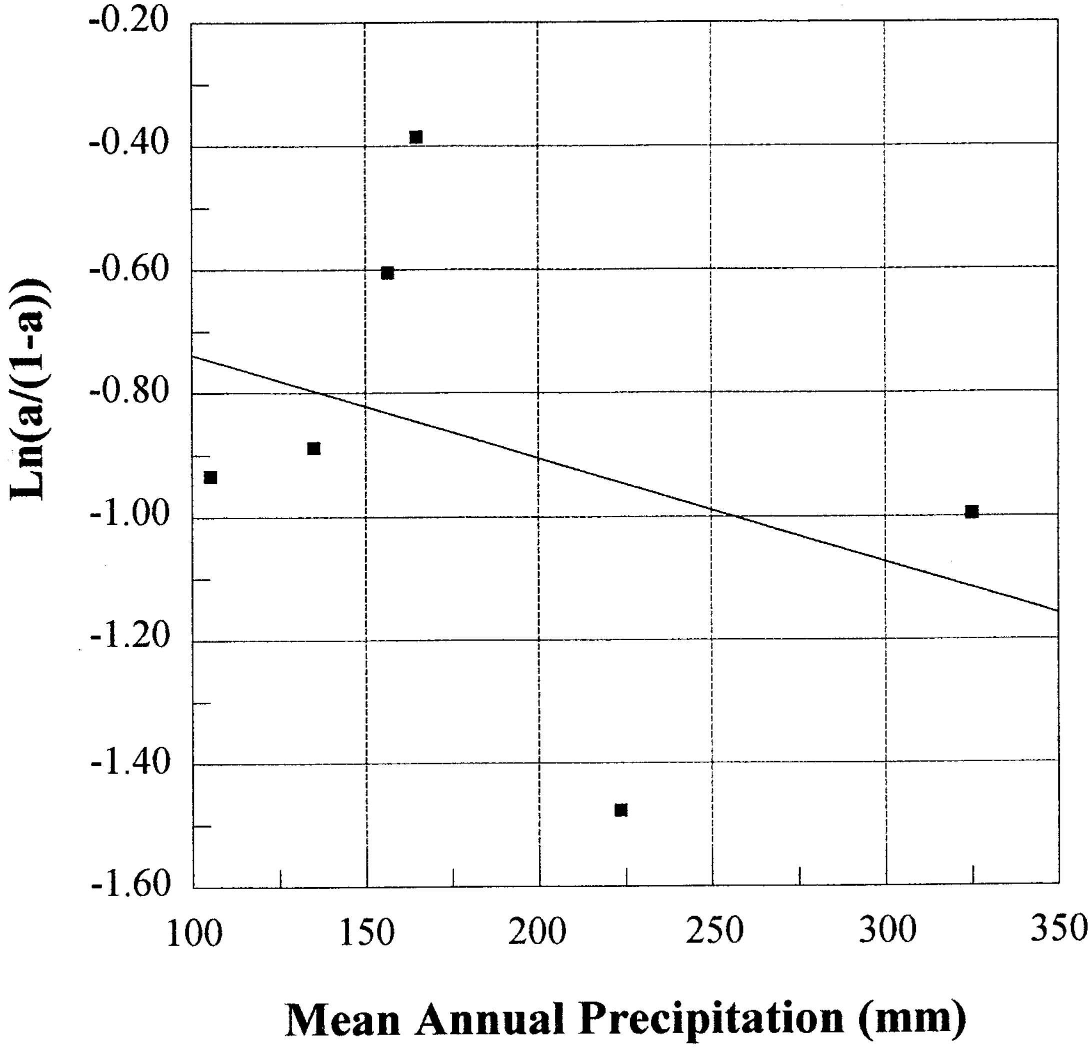
The average of α, $\bar{\alpha} = 0.298$ will be used as a constant for repeat runs. The objective of the repeat runs is to see if by using a regional value for α, there will be a more clear cut relation between the Fourier coefficients for β and μ and mean annual precipitation.

Note: There is a weak correlation between α and an. precip

$\alpha = 0.3598 - 0.000345 P$ $R^2 = 0.123$ $R = 0.351$

Scatter diagram: AlphaVSP.PGW

ALBETA.PDW



$\ln\left(\frac{\alpha}{1-\alpha}\right) = -0.5695 - 0.00168\,P$ $R = 0.356$ $R^2 = 0.127$

CLIMATE\LogitvsP.PGW   DAW 8/6/99

Dial

==

Linear Fitting Report

Data File Name: C:\CONSULT\SWRI\CLIMATE\ALBETA.PDW

==

Model Equation(s):
LOGIT=B+A*ANPMM

Initial Parameters:

A=	-0.0016809110
B=	-0.56955707

Save Options:
Save Data

Number of Function Calls: 2

Parameters After Fitting:

A=	-0.0016809110
B=	-0.56955707
SumSqr:	0.60617079
StdDev:	0.19464243

Covariance Matrix:

cvm[1,1]:	0.00003215360
cvm[2,1]:	-0.0059494884
cvm[2,2]:	1.26752034

Goodness of Fit Statistics ...

__ C O D:	0.12661127
__ Corrl:	0.35582477
__ M S C:	-0.53129213

Parameter Statistics...

Parameter: A= -0.0016809110

StdDev:	0.0022074066
Coeff. of Variance:	-131.32203794

__95 % Confidence Interval

__ Uninvariant ...

LOW:	-0.0078096537
HIGH:	0.0044478317

__ Supporting Plane ...

LOW:	-0.0099073274
HIGH:	0.0065455054

Parameter: B= -0.56955707

StdDev:	0.43827326
Coeff. of Variance:	-76.94984139

_95 % Confidence Interval

__ Uninvariant ...

LOW:	-1.78639862
HIGH:	0.64728449

__ Supporting Plane ...

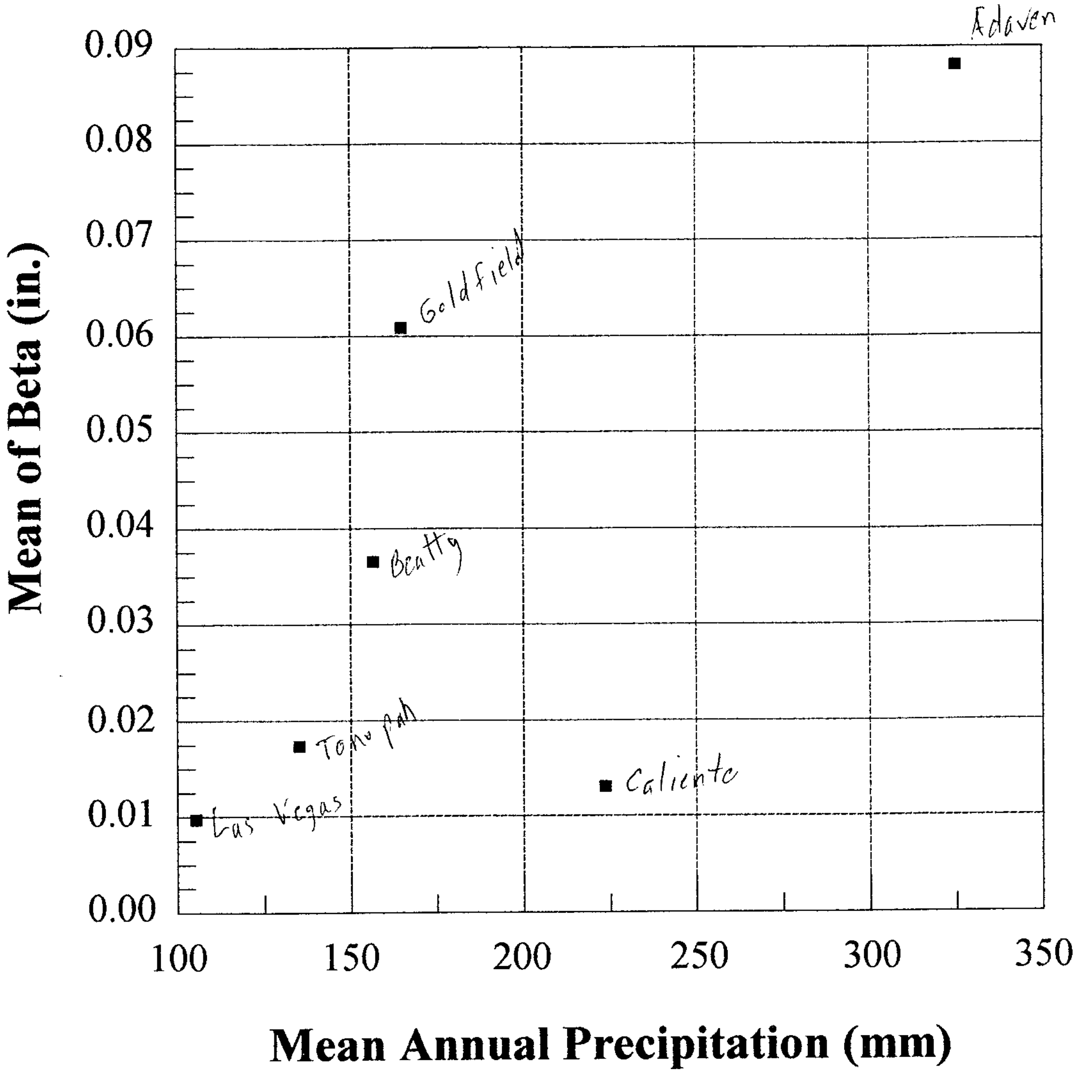
LOW:	-2.20288478
HIGH:	1.06377065

==

----Created by D. A. Woolhiser with ProStat
----Fri Aug 06 11:21:25 1999

==

ALBETA.PDW



$\bar{\beta} = -0.00823 + 0.1538\alpha \quad R^2 = 0.137$

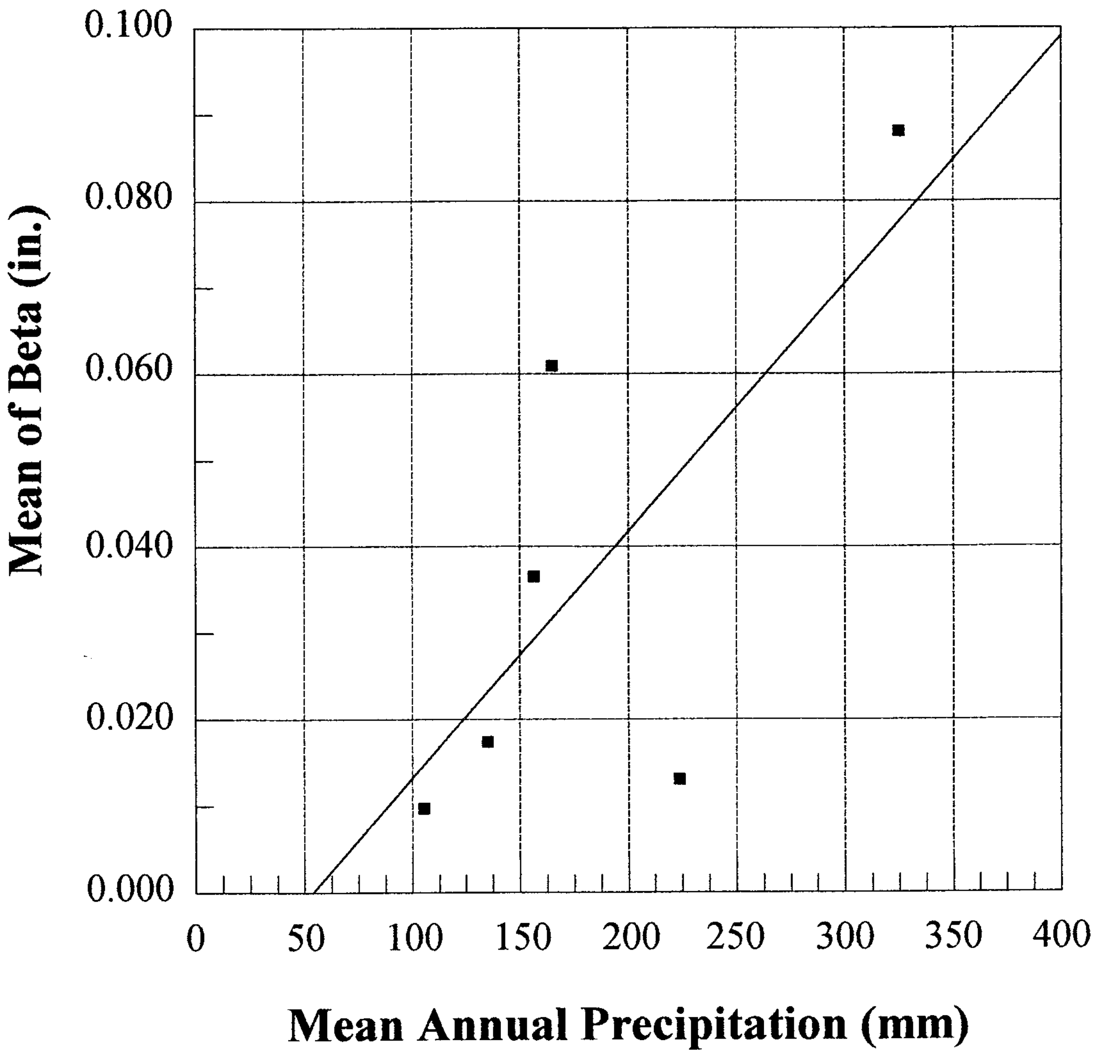
$\bar{\beta} = -0.01534 + 0.000286\,\bar{p} \quad R^2 = 0.522 \quad R = 0.723$

$\bar{p}$ in mm.

Large variation in amplitudes and phase ∠s

DAW 8/6/99

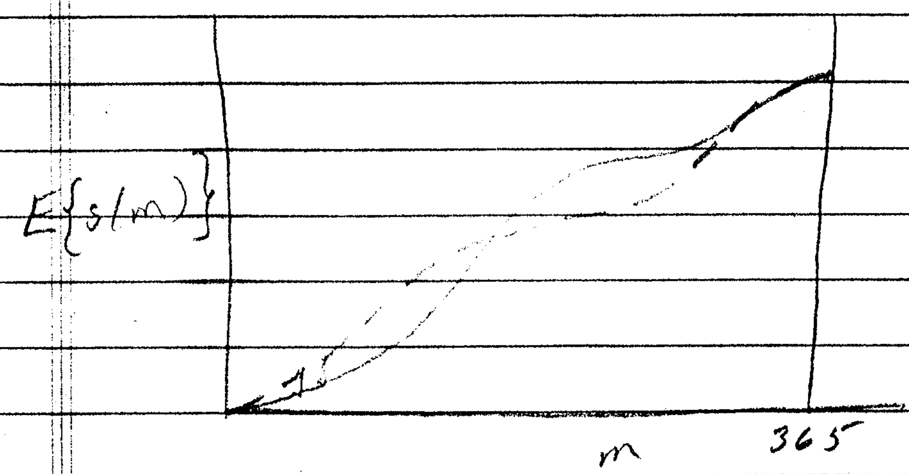
ALBETA.PDW


0.100
0.080
0.060
0.040
0.020
0.000
Mean of Beta (in.)
0
50
100
150
200
250
300
350
400
Mean Annual Precipitation (mm)

← DAW

$$E\{S(m)\} = \sum_{n=1}^{365} \left[P\{X(n-1)=0\} p_{01}(n) + P\{X(n-1)=1\} p_{11}(n) \cdot \left[\underbrace{\alpha(n)\beta(n) + \{1-\alpha(n)\}\delta(n)}_{\mu(n)} + T \right] \right]$$

$\mu(n) + T$



suppose that the seasonality changes as indicated by the dotted line, but the annual mean precip. doesn't change. Let this series be $E'\{S(m)\}$

We wish to minimize $\sum_{m=1}^{365} \left(E\{S(m)\} - E'\{S(m)\} \right)^2 = F$

under the constraint that $E\{S(365)\} = E'\{S(365)\}$

changes can be made in phase $\angle^s$ and amplitude of G_{00}, G_{10}, ~~μ~~ DAW 4/1/04 and μ

First assume that $\overline{G_{00}}$, $\overline{G_{10}}$ and $\overline{\mu}$ do not change

Parameters that could change:

C_{100}, ϕ_{100}, C_{200} ϕ_{200}, C_{300} ϕ_{300}, C_{400} ϕ_{400}

C_{110} ϕ_{110}, C_{210} ϕ_{210}, C_{310} ϕ_{310}

$C_{\mu 1}$ $\phi_{\mu 1}$ $C_{\mu 2}$ $\phi_{\mu 2}$ $C_{\mu 3}$ $\phi_{\mu 3}$

DAW

This brings up an interesting question" Is there a correlation between phase angles and amplitudes of G_{00} + G_{10} and μ?

$$dF = \frac{\partial F}{\partial C_{100}} \Delta C_{100} + \frac{\partial F}{\partial \phi_{100}} \Delta \phi_{100} + \cdots + \frac{\partial F}{C_{\mu 1}} \Delta C_{\mu 1} + \frac{\partial F}{\partial \phi_{\mu 1}} \Delta \phi_{\mu 1}$$

$$\frac{\partial F}{\partial C_{100}} = 0$$

$$\frac{\partial F}{\partial \phi_{100}} = 0$$

|
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|
|
|

TABLE OF COMPUTER RUNS FOR FUTURE CLIMATE STUDIES

Run # & Date	Program	.CON File	Input File .PTT	Output Files	No. Of Harmonics	Comments
C1 8/3/99	MELSIREV	CALLENME	CALIENTE.PTT		4	2 harmonics gave lower AIC
C2 8/3/99	MCFO1R	TONOPAHMC	TONOPAH.PTT	TONOPAH.OUT	4	
C3 8/4/99	"	CALIENMC	CALIENTE	CALIEN4.OUT	4	N=40, 1929-68
C4 "	"	ADAVENMC	ADAVEN1	ADAVEN4.OUT	4	~~N=40~~ N=32, 1930
C5 "	"	BEAT8NMC	BEATTY8N	BEAT8N4.OUT	4	N=24, 1973
C6 "	"	GOLD4MC	GOLDFIEL	GOLD4.OUT	4	N=28, 1949
C7 "	MCFO1R	VEGAS4MC	VEGAS	VEGAS4.OUT	4	N=57, 1937
C8 "	MELSIREV	VEGAS3ME	VEGAS	VEGAS3ME.04, .05, .06	3	N=~~57~~ 40, 1937
C9 "	"	ADAV3ME	ADAVEN~1	ADAV3ME.04, .05, .06	3 β=3	N=32, 1930
C10 "	"	BEAT8NME	BEATTY8N	BEAT3ME.04, .05, .06	3	N=24, 1973
C11 "	"	GOLD3ME	GOLDFIEL	GOLD3ME.04, .05, .06	3	N=28, 1949
C12 "	"	TONO3ME	TONOPAH	TONO3ME.04, .05, .06	3	N=42, 1955
C13 8/6/99	MELSIREV	ADA3MEA	ADAVEN~1	ADA3MEA.01, .02, .03	3 β=2	α = 0.298 } computer program error
C14 "	"	BEA3MEA	BEATTY8N	BEA3MEA.01, .02, .03	3	α = 0.298 } constant α as input doesn't work
C15 1/12/00	MIXEX2000	CAL3MEA	CALIENTE.	CAL3MEA.01, .02, .03	β=2 μ=3	CAL~~3MEA~~ 4MEA.MCP
C16 1/19/00	"	GOL~~3MEA~~ C16	GOLDFIEL	GOLD3MEA.01B, .02B, .03B	α β=2 μ=3	GOL~~4MEA~~ 4MEA.MCP (171273)
C17 "	"	TON~~3MEA~~ C17	TONOPAH	TONC17, .01, .02, .03	α " "	13 par. L=1753.33, ~~1698.64~~ 1500 eval.
C18 "	"	VEG~~3MEA~~ C18	VEGAS	VEGC18 .01 .02 .03	α " "	13 par. L=1114.87, 1117.51, 24 p 1179.81
C19 "	"	BEA~~TTE~~ C19	BEATTY8N	BEAC19 .01, .02, .03	α β=2, μ=3	13 par L=665.039, 618.739, 620.781
C20 1/19/00	MIXEX2000	~~BEA~~ CALC20	CALIENTE	CAL3MEA.01B, .02B, .03B	α β=2 μ=3	13 par. L=1641.54 ~~GOL4MEA.MCP~~
C21 1/19/00	"	ADAC21	ADAVEN~1	ADAC21 .01 .02 .03	α β=2 μ=3	13 par 483.787, 430.618, 436.098
C16 1/21/00	" rerun	GOLC16	GOLDFIEL	GOLC16 .01 .02 .03	" " "	648.09, 603.09, 612.81

FUTURE CLIMATE RUNS

Run No.	Program & Date	Input File	Output File	Target P_A	P_A	No. of wet days	Comments
FUT1	DISPLAY2 2-25-00	FUT1.MEP	FUT1.DAT	306.5 mm	317.91	46.6	Base – Beatty 8n, slope
FUT2	〃	FUT2.	FUT2	306.5	306.38	44.9	Base – Adaven, slope
FUT3	〃	FUT3	FUT3	306.5	322.26	48.8	Regional Regression + averages

The program WGENPAR.FOR can be used for the analysis

Procedure: DAW

1. Write a BASIC program to convert *.TXT files to input file for WGENPAR ie

IMO	IDA	IYR	V1 (tmax)	V2 (tmin)	V3 (precip)	V4 (rad)
I2	I2	I2	F6.1	F6.1	F6.2	6X F6.2

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Note: Code for missing data is 99.99

WGENPAR assumes that data starts on Jan 1 and ends Dec 31

Program Name is DAYREADT.BAS modified from DAYREAD.BAS

output file extension is ~~.TAR~~ .TPR (Temperature ~~and~~ Precipitation Radiation)

DAW 4/2/04 DAW 4/2/04

6/3/99

Run WGENPAR2 with BEATTY~1.TPR as input

output file 1 = " .FIL
" " 2 = " .DAT

Did not run. Got message "DOSXMSF.EXE must be in path."

Sent e-mail to C. Richardson asking for suggestions.

Set up input file for WGENPAR2

BEATTY8N:

1. Copy BEATTY8N.TXT to BEATTY8N.IN
2. Edit .IN to begin at 1/1 and end at 12/31
   starts at 1974 ends 12/31/97 84 missing
   97-74 = 23 yrs.
3. RUN DAYREADT.BAS - Get BEATTY8N.TPR ←

Got message that DOSXMSF.EXE required to run program. Sent e-mail to C. Richardson. He attached that file. Downloaded to Climate

6/4/99 Run BEATTY8N.TPR run successful
output BEATTY23.FIL
" .DAT

DAW

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CALIENTE

1. Copy CALIENTE.TXT to CALIENTE.IN
2. Edit to begin Jan 1 and end Dec. 31 ✓
3. Run DAYREADT.BAS - Get CALIENT.TPR ✓
   20,083 − 9 = 20,074 = 55 yrs. Took off 2 yrs
4. RUN WGENPARZ run with 55 yrs.

   CALIENTE.TPR
   CALIENTE.FIL ✓
   CALIENTE.DAT

TONOPAH

1. Copy TONOPAH.TXT to TONOPAH.INE ✓
2. Edit 14973 − 9 = 14,964 ÷ 365 = 41 yrs ✓
3. Run DAYREADT.BAS GET TONOPAH.TPR ✓
4. RUN WGENPARZ 40 yrs. ✓
   TONOPAH.FIL ✓
   " .DAT

ADAVEN~1

1. Copy ADAVEN~1.TXT TO ADAVEN.INE ✓
2. Edit 11323 − 9 + 1 = 11315 = 31 yrs ✓
3. Run DAYREADT.BAS ✓ ← GET ADAVEN.TPR
4. Run WGENPARZ 30 yrs ✓
   ADAVEN.FIL
   " .DAT

LAS VEGAS 37-

1. Copy VEGAS.TXT to VEGAS.INE ✓
2. Edit ✓ 20448 − 9 + 1 = 20440 ÷ 365 = 56 yrs. ✓
3. Run DAYREADT.BAS ✓ GET VEGAS.TPR
4. Run WGENPARZ 35 yrs
   VEGAS.FIL
   " .DAT

No. 5505 Engineer's Computation Pad ALVIN

Create a spreadsheet file (PSIPLOT) with temperature statistics.

FILE NAME: TEMPSTAT.PDW — DAW

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Column Statistics: TEMPCOLSTAT.TXT

Column Headings:

1 STATION
2 Ann P – Av. annual precip. from record analysed
3 TXMD – Mean of T_{max} for dry days
4 ATX – Amplitude " " "
5 CVTZ – Coefficient of variation of T_{max} for wet + dry days (unadjusted)
6 CVTX – " " " " " (adjusted)
7 ACVTZ – amplitude of CV of T_{max} w+d (unadjusted)
8 ACVTX – amplitude of coef. of variation of T_{max} w+d (adjusted)
9. TXMW – mean of T_{max} for wet days
10 TN – mean of T_{min} for wet or dry days
11 ATN – amplitude of T_{min} for wet or dry days
12 CVTNZ – coefficient of variation of T_{min} for wet or dry days (unadjusted)
13 CVTN – " " " " (adjusted)
14 ACVTNZ – Amplitude of the coefficient of variation of T_{min} w or dry (unadjusted)
15 ACVTN – " " " " " " (adjusted)

$$CVTX = \frac{CVTZ * TXMD}{(100 + TXMD)}$$

$$ACVTX = \frac{ACVTZ * TXMD}{(100 + TXMD)}$$

$$CVTN = \frac{CVTNZ * TN}{(100 + TN)}$$

$$ACVTN = \frac{ACVTNZ * TN}{(100 + TN)}$$

7/8/99

Exploratory statistics

1. Relation between mean annual ~~Rain~~fall and elevation + Latitude (DAW 4/7/04)

Elev. is highly correlated with latitude

$E = -66261.8 + 1892 * L$ $\qquad R^2 = 0.917$

So a multiple regression; $P = a + b_1 E + b_2 L$ would give spurious results.

$P = 1.365 + 0.00129\, E$ $\qquad R^2 = 0.41$

No. 5505 Engineer's Computation Pad ALVIN

GOLDFIELD ~1997 DAW

1. COPY GOLDFIEL.TXT to GOLDFIEL.INE ✓
2. Edit ✓ 9863 − 8 = 9855 ÷ 365 = 27 yrs ✓
3. RUN DAYREADT.BAS. Get GOLDFIEL.TPR ✓
4. Run WGENPAR2. 27 yrs ✓

   GOLDFIEL.FIL ✓
   " .DAT

6/7/99 Adjustment of Coefficients of variation mean and amplitudes. DAW 4/4/04

CVTX = ~~coef.~~ mean of CV of Tmax for wet or dry days

ACVTX = amplitude of CV of Tmax " " "

CVTN = mean of CV of Tmin for wet or dry days

ACVTN = amplitude of CV " " " "

Hanson, et al. (1994) corrected a problem with WGEN by adding 100°F to all daily maximum and minimum temperature values. The coefficients of variation were adjusted to reflect this transformation

Adjustment of CVs

let x = a random variable with mean $\bar{x}$, var = s^2

let $z = x + 100$

The coefficient of variation $CV_x = s/\bar{x}$ what is CV_z

$$Var\{z\} = Var\{x+100\} = Var\{x\}$$

$$\bar{z} = 100 + E\{x\} = 100 + \bar{x}$$

$$CV_z = \frac{\sqrt{Var\{z\}}}{\bar{z}} = \frac{\sqrt{Var\{x\}}}{100+\bar{x}} = \frac{s_x}{100+\bar{x}}$$

$$(100+\bar{x})\,CV_z = s_x \qquad s_x = \bar{x}\,CV_x$$

$$(100+\bar{x})\,CV_z = \bar{x}\,CV_x \qquad CV_z = \frac{CV_x\,\bar{x}}{(100+\bar{x})} \longleftarrow CV_z$$

2. Are there any relationships between temperature model parameters and elevation.

~~TAMD = 78.44 - X.17E R^2 = 0.358~~ DAW 4/2/04

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~~TXAD = ... = 0.0046 LAT R^2 = 0.885~~ DAW 4/2/04

TXMD = 87.46 - 0.00374 E $R^2 = .98$ O.K.

This makes sense 3.74°/1000 ft

Try TN vs Elev

TN = 59.62 - 0.004084 E $R^2 = 0.82$ OK

6/19/99 4.084° / 1000 ft

TEMPCOLSTAT.TXT

Try TXMW vs Elev.

TXMW = 77.756 - 0.003408 E $R^2 = 0.965$ OK

MSC: = 2.69 3.408°/1000 ft

CVTX

CVTX = 0.10645 - 0.00000884 E $R^2 = 0.424$

ACVTX

ACVTX = -0.01933 - 0.0000001906 E $R^2 = 0.272$

ATN

ATN = 20.003 - 0.0004374 E $R^2 = 0.202$

CVTN $R^2 = 0.003$

ACVTN $R^2 = 0.049$

Normal Lapse Rate = 3.6 °F / 1000 ft Trewartha p 78

vertical temp. gradient is ~ 1,000 x the rate of temp change due to latitude.

? Are the gradients from the analysis significantly different from the ~~average~~ normal lapse rate? DAW 4/2/04

Dry adiabatic lapse rate = 5.54 °F / 1000 ft p 126 Trewartha

Retarded or wet adiabatic rate { at low temperatures ≈ to dry adiabatic; at high temperatures ≈ 1/2 dry adiabatic

Note: Copied USCLIMAT.BAS to FUTCLIM.BAS
Work with this version if I need to revise program
Note: Can input measured precip. data

DAW

DAW


```
'PROGRAM PDISPLAY.BAS by DAW 10/28/99
'This program creates a file of daily values of Markov chain
'parameters,'Poo, Plo, and mixed exponential parameters, alpha,
'beta and mu.  It also'computes the expected accumulated
'precipitation.
'  Input consists of the mean, amplitudes and phase angles of the
'finite Fourier series of the logits of Poo and Plo and also the
'Fourier series of alpha, beta and mu of the mixed exponential
'distribution of daily precipitation.
'*************************************************************
'GOOPAR(I)=Fourier coefficients of GOO (mean, amplitudes & phase angles)
'G1OPAR(I)=Fourier coefficients of G10          "
'ALPHAPAR(I)=Fourier coefficients of ALPHA
'BETAPAR(I)= Fourier coefficients of BETA
'MUPAR(I)= Fourier coefficients of MU
'G00(I)=logit of dry-dry transition probability.  Goo=log(p/1-p)
'G10(I)=logit of wet-dry transition probability.
'ALPHA(I)=daily weighting factor in mixed exponential distribution
'P00(I)=Probability that day I was dry given day I-1 was dry
'P10(I)=Probability that day I was dry given that day I-1 was wet.
'BETA(I)=daily mean of the smallest exponential distribution, mm.
'MU(I)=daily mean of the mixed exponential distribution, mm.
'THETA(I)= mean of the largest of the mixed exponential
'T= Threshold subtracted from precipitation depth to enable a mixed
'exponential fit in interval 0 to infinity. 0.008 inches
'PWET= unconditional probability of a wet day
'SUM(I)=Expected total precipitation including day I.  See Hanson
'et al. "Microcomputer Program for Daily Weather Simulation in the
'Contiguous United States" ARS - 114, 1994.

OPTION BASE 1
DIM G00(365), G10(365), ALPHA(365), BETA(365), MU(365)
DIM GOOPAR(10), G10PAR(10), ALPHAPAR(9), BETAPAR(9), MUPAR(9)
T = .008
INPUT "ENTER INPUT FILE NAME, EXTENSION WILL BE .ME  ", INFILE$
        OPEN INFILE$ FOR INPUT AS #1
'Create name for output file. Name will be the same except the
'extension will be .DAT.
N% = LEN(INFILE$) - 3
OUTFILE$ = LEFT$(INFILE$, N%) + "DAT"
        OPEN OUTFILE$ FOR OUTPUT AS #2
'Read parameters for Markov chain.  The format is set up so that
'parameter values can be created easily from output files of MCFOUR
'and MIXEX
'Mean and amplitudes
INPUT #1, GOOPAR(1), GOOPAR(2), GOOPAR(3), GOOPAR(4), GOOPAR(5)
'Phase angles (6) will always be zero
INPUT #1, GOOPaR(6), GOOPAR(7), GOOPAR(8), GOOPAR(9), GOOPAR(10)
INPUT #1, G10PAR(1), G10PAR(2), G10PAR(3), G10PAR(4), G10PAR(5)
INPUT #1, G10PAR(6), G10PAR(7), G10PAR(8), G10PAR(9), G10PAR(10)

'Read parameters for mixed exponential
'mean, 1st amplitude, 1st phase angle, 2nd amplitude, 2nd phase angle, e
INPUT #1, ALPHAPAR(1), ALPHAPAR(2), ALPHAPAR(3), ALPHAPAR(4), ALPHAPAR(5
INPUT #1, BETAPAR(1), BETAPAR(2), BETAPAR(3), BETAPAR(4), BETAPAR(5), BE
INPUT #1, MUPAR(1), MUPAR(2), MUPAR(3), MUPAR(4), MUPAR(5), MUPAR(6), MU

'Calculate Fourier series for each day
'Markov chain
FOR I = 1 TO 365
```

G00(I)=0, G10(I)=0 — DAW

```
FOR J = 1 TO 4
    G00(I) = G00PAR(J + 1) * SIN(.017214 * J * I + G00PAR(J + 6))
    G10(I) = G10PAR(J + 1) * SIN(.017214 * J * I + G10PAR(J + 6))
NEXT J
        G00(I) = G00(I) + G00PAR(1)' Add mean
        G10(I) = G10(I) + G10PAR(1)
'Transform to probabilities
        P00(I) = EXP(G00(I)) / (1! + EXP(G00(I)))
        P10(I) = EXP(G10(I)) / (1! + EXP(G10(I)))
NEXT I
'
'Mixed exponential
FOR I = 1 TO 365
FOR J = 1 TO 9
        ALPHA(I) = ALPHAPAR(J + 1) * SIN(.017217 * J * I + ALPHAPAR(J +
        BETA(I) = BETAPAR(J + 1) * SIN(.017217 * J * I + BETAPAR(J + 2))
        MU(I) = MUPAR(J + 1) * SIN(.017217 * J * I + MUPAR(J + 2))
NEXT J
        ALPHA(I) = ALPHA(I) + ALPHAPAR(1)' Add means
        BETA(I) = BETA(I) + BETAPAR(1)
        MU(I) = MU(I) + MUPAR(1)
        'Compute theta
        THETA(I) = (MU(I) - ALPHA(I) * BETA(I)) / (1! - ALPHA(I))
NEXT I
'Compute expected sum of precipitation on day I
'Approximate probability of a wet day 365
        PSTART = (1! - P00(365)) / (1! + P10(365) - P00(365))
        PWET = PSTART
        PDRY = 1! - PSTART
        SUM(1) = (PDRY * P01(1) + PWET * (1! - P10(1))) * (MU(1) + T)
        PWET = (PDRY * P01(1) + PWET * (1! - P10(1)))
FOR I = 2 TO 365
        PWET = (1 - PWET) * P01(I) + PWET * (1 - P10(I))
        SUM(I) = SUM(I - 1) + PWET * (MU(I) + T)
NEXT I

'Print to file
FOR I = 1 TO 365
        PRINT #2, USING "###  #.###  #.###  #.###  #.###  ##.###  ####.#
NEXT I
CLOSE #1
CLOSE #2
END
```

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G00(I)+ G10(I)+ DAW 4/2/04 ALPHA(I)=0, BETA(I)=0 MU(I)=0 K DAW 4/2/04 7, 2 ALPHA(I)+ BETA(I)+ MU(I)+ phase K=1 K=K+1 (1-P00) (1-P00(I))

J=1 ALPHA(I)= AMP(1) * sin(...) + φ(1)

J=3 ALPH(I) + AMP(3) — DAW 4/2/04

1, 2, 3, 4; =5, =7; 5, 6, 7, 8, 9; J+1

```
'PROGRAM DAYREADT.BAS By DAW 6/2/99
'This program will read a line from the National Weather Service
'daily data format and will write the month, day, year, daily rainfall
  ıount in inches,'the maximum daily temperature and the minimum daily temperatu
·uegrees F to a file in a format readable by WGENPAR.FOR.  Missing data will
'be coded as 99.99.  Output format will be
' in the FORTRAN form 3I2, 2F6.1, F6.2, 6x, F6.2
'
OPTION BASE 1
        INPUT "ENTER INPUT FILE NAME", INFILE$
        OPEN INFILE$ FOR INPUT AS #1
'Create output file name
        N% = LEN(INFILE$) - 3
        OUTFILE$ = LEFT$(INFILE$, N%) + "TAR"'Add extension TAR to infile
'        name.
        OPEN OUTFILE$ FOR OUTPUT AS #2

'       Read heading information
        INPUT #1, A$
        PRINT #2, A$' Print title
        FOR I% = 1 TO 8
                INPUT #1, A$
'                PRINT , A$
        NEXT I%
        INPUT "ENTER STATION LATITUDE IN DEGREES", ALAT
        KSD = 1

        PRINT #2, USING "          #########.     #####"; ALAT; KSD
        RAD = 99.99
        DO WHILE NOT EOF(1)' Begin reading loop
                INPUT #1, A$
'                PRINT , A$
                YR$ = MID$(A$, 3, 2)' Read last 2 digits of year
                MO$ = MID$(A$, 5, 2)' Read month

                DAY$ = MID$(A$, 7, 2)'Read day
                MODAYR$ = MO$ + DAY$ + YR$
                DATE = VAL(MODAYR$)
                PRECIP$ = MID$(A$, 12, 4)
                P = VAL(PRECIP$) / 100!'Convert string to decimal inches
                PCODE$ = MID$(A$, 16, 1)' Measurement flag
                 IF PCODE$ = "M" THEN P = 99.99' Missing data
                TMAX$ = MID$(A$, 34, 3)
                TMAX = VAL(TMAX$)
                        TMAXCOD$ = MID$(A$, 38, 1)' Measurement flag
                        IF TMAXCOD$ = "M" THEN TMAX = 99.99

                TMIN$ = MID$(A$, 41, 3)
                TMIN = VAL(TMIN$)
                        TMINCOD$ = MID$(A$, 44, 1)
                        IF TMINCOD$ = "M" THEN TMIN = 99.99
    PRINT #2, USING "###### ###.# ###.# ##.##      ###.##"; DATE; TMAX; TMIN; P;
'

        LOOP

                CLOSE #1
                CLOSE #2
        END
```

Tmax w/D
AB

C:\consult\swri\CLIMATE\TEMPSTAT.PDW

Station	Annual P	TXMD	ATX	CVTZ	CVTX	ACVTZ	ACVTX	TXMW
Adaven	12.79	64.483	21.938	0.157		-0.099	DAW 4/2/04	~~66~~.55.748
Beatty8n	6.16	75.445	20.812	0.109		-0.049		66.735
Caliente	8.80	70.764	23.584	0.179		-0.056		64.023
Goldfield	6.49	65.148	22.167	0.139		-0.072		58.015
Las Vegas	4.15	78.743	23.206	0.236		-0.067		69.171
Tonopah	5.32	67.348	22.887	0.135		-0.068		59.193

DAW

Worksheet.
DAW 7/7/99

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C:\consult\swri\CLIMATE\TEMPSTAT.PDW

TN	ATN	CVTNZ	CVTN	ACVTNZ	ACVTN	Column16
35.54	16.578	0.300		-.241		1.0000
43.847	16.055	0.174		-.064		
36.888	18.568	0.358		-.275		
39.067	18.373	0.225		-.136		
53.611	20.176	0.221		-.138		
36.552	18.248	0.221		-.153		1.0000

	NW	MISS
Adaven	44.75	2.13
Beatty	32.47	0.33
Caliente	48.97	2.53
Goldfield	31.36	4.32
Las Vegas	25.83	0
Tonopah	36.81	0.02

TXMO = 72.61 + 0.412 LAT − 0.00382 ELEV

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C:\CONSULT\SWRI\CLIMATE\TEMPSTAT.PDW

Station	Annual P*	TXMD	ATX	CVTZ	CVTX	ACVTZ	ACVTX	TXMW
Adaven *	12.75 12.7900	64.4830	21.9380	0.1570	0.0615	-0.0990	-0.0388	55.743
Beatty8n	6.27 6.1600	75.4450	20.8120	0.1090	0.0469	-0.0490	-0.0211	66.735
Caliente	8.83 8.8000	70.7640	23.5840	0.1790	0.0742	-0.0560	-0.0232	64.073
Goldfield	5.70 6.4900	65.1480	22.1670	0.1390	0.0548	-0.0720	-0.0284	58.015
Las Vegas	3.99 4.1500	78.7430	23.2060	0.2360	0.1040	-0.0670	-0.0295	69.171
Tonopah AP	6.06 5.3200	67.3480	22.8870	0.1350	0.0543	-0.0680	-0.0274	59.193
Mean		70.32	22.43		0.06595		-0.02806	62.15
std dev		5.78	1.01		0.0207		0.00617	5.305
CV		0.082	0.0456		0.3139		0.2199	0.0854
R^2 reg. w/elev		0.98	NS		R^2=0.424		0.923	0.965

* Annual P is from these data files. French shows different values.
* French (1983) Probably due to different periods of record.

DAW 7/8/99

DAW

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TN	ATN	CVTNZ	CVTN	ACVTNZ	ACVTN	Latitude	Elevation	Wet Days	Av
35.5400	16.5780	0.3000	0.0787	-0.2410	-0.0632	38.1170	6250.0000	44.7500	
43.8470	16.0550	0.1740	0.0530	-0.0640	-0.0195	37.0000	3550.0000	32.6700	
36.8880	18.5680	0.3580	0.0965	-0.2750	-0.0741	37.6170	4400.0000	48.9700	
39.0670	18.3730	0.2250	0.0632	-0.1360	-0.0382	34.7000	5690.0000	31.3600	
53.6110	20.1760	0.2210	0.0771	-0.1380	-0.0482	36.0800	2160.0000	25.8300	
36.5520	18.2480	0.2210	0.0592	-0.1530	-0.0410	38.0670	5430.0000	36.8100	

	TN	ATN	CVTN	ACVTN	Latitude
Mean	40.92	18.00	0.0713	-0.0474	37.7
std. dev	6.89	1.49	0.0159	~~0.1932~~ .01932	
CV	0.168	0.0828	0.223	0.4076	
R^2	0.82	0.202	0.003	0.049	

DAW 4/2/04

DAW

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Av.Miss.
2.1300
0.3300
2.5300
4.3200
0.0000
0.0200

Daw

127

Content-Type: text/plain; charset="us-ascii"
Content-Disposition: attachment; filename="WGENPAR2.FOR"


```
$debug
   PROGRAM WGENPAR.FOR Revised 6/97 GSM
c    revised 11/97  - added prompt to screen for file names and number
c    of years running  - gsm
C     ***************************************************************
C     *                                                             *
C     *                  DEE ALLEN WRIGHT                           *
C     *                  COMPUTER PROGRAMMER                        *
C     *                  FEBRUARY 25, 1983                          *
C     *                                                             *
C     ***************************************************************
      CHARACTER*80 FNAME,FPRN,fdata,fprn2
      DIMENSION TMAX(105,365),TMIN(105,365),RAIN(105,365),RAD(105,365)
C      DIMENSION AA(20)
      character*80 TITLE
      DIMENSION RC(365)
      DIMENSION XDATA(30),YDATA(4,12)
      DATA KR1,KW,kw1/2,6,7/
c  change per cwr 11/5/97 gsm
c   to prompt for file names
      WRITE(*,5002)
 5002 FORMAT(1X,'Enter the Input Weather file Name (e.g temple.wth)')
      READ(*,11)fdata
  11   FORMAT(a80)
      WRITE(*,5003)
 5003 FORMAT(1X,'Enter the Output file Name (e.g temp15.fil)the 15 repre
     1sents the number of Years running')
      READ(*,12)fprn
  12   FORMAT(a80)
      WRITE(*,5004)
 5004 FORMAT(1X,'Enter the Output file Name which is the input for wgenp
     1ar2(e.g temp15.dat)')
      READ(*,13)fprn2
  13   FORMAT(a80)
      fname = fdata
      OPEN(KR1,FILE=FDATA,STATUS='OLD')
      OPEN(KW,FILE=FPRN,STATUS='UNKNOWN')
      OPEN(KW1,FILE=FPRN2,STATUS='UNKNOWN')
      WRITE(*,*) ' Weather data set    :',FDATA(1:58)
      WRITE(*,*) ' Output              :',FPRN(1:58)
      WRITE(*,*) ' Output that is Input for wgenpc2  :',FPRN2(1:58)
c  change per cwr 11/5/97 gsm
c    to prompt for number of years
      WRITE(*,5001)
 5001 FORMAT(1X,'ENTER THE NUMBER OF YEARS (e.g 15)')
      READ(*,10)nyrs
  10  FORMAT(I10)

      DO 1 I=1,30
      XDATA(I)=0.0
1     CONTINUE
      DO 2 I=1,4
      DO 2 J=1,12
      YDATA(I,J)=0.0
2     CONTINUE
C*************************************************************************
C
```

```
C-----INPUT #1  TITLE OF DATA SET (20A4)
C
C*******************************************************************************
      READ(KR1,100)TITLE
c      READ(kr1,100)(AA(I),I=1,20)
100   FORMAT(A)
c      WRITE(kw,101) (AA(I),I=1,20)
      WRITE(kw,101) TITLE
101   FORMAT('1',//,'DATA IS -----',A,//)
      WRITE(kw1,1001) fNAME
1001  FORMAT(' Generation Parameters for ',a80)

C*******************************************************************************
C
C-----INPUT #2  NUMBER OF YEARS, LATITUDE, AND SOLAR RADIATION STATUS
C               (IF NO SOLAR RADIATION DATA, KSD = 1)
C*******************************************************************************
change per cwr 11/5/97 gsm
c  to prompt to screen for Number of years
c      READ(kr1,102) NYRS,ALAT,KSD
c102    FORMAT(I10,F10.0,I10)
      READ(kr1,102) ALAT,KSD
102   FORMAT(10x,F10.0,I10)
      kgen=1
      write(kw1,1002)nyrs,kgen,alat
1002  format(2i5,f5.1)
      XYRS=NYRS
      XLAT=ALAT*6.2832/360.
      DO 6 I = 1,365
      XI = I
      SD = 0.4102*SIN(0.0172*(XI-80.25))
      CH = -TAN(XLAT)*TAN(SD)
      IF (CH .GT. 1.0) H = 0.
      IF (CH .GT. 1.0) GO TO 5
      IF(CH .LT. -1.0) H = 3.1416
      IF(CH .LT. -1.0) GO TO 5
c      H = ARCOS(CH)
      H = ACOS(CH)
5     DD=1.0+0.0335*SIN(0.0172 *(XI+88.2))
      RC(I)=889.2305*DD*((H*SIN(XLAT)*SIN(SD))+(COS(XLAT)*COS(SD)*SIN(H)
     *))
      RC(I)=RC(I)*0.80
6     CONTINUE
      v1m1 = 70.
      v2m1 = 40.
      v4m1 = 450.
      DO 7 I = 1,NYRS
      DO 7 J = 1,365
C*******************************************************************************
C
C----- INPUT #3  DAY, MO, YEAR, RADIATION, MAX TEMP, MIN TEMP, RAINFALL
C
C*******************************************************************************
8     READ(kr1,103) IMO,IDA,IYR,V1,V2,V3,V4
      IF(IMO .EQ. 2 .AND. IDA .EQ. 29) GO TO 8
      if(v1.eq.99.99) v1 = v1m1
      if(v2.eq.99.99) v2 = v2m1
      if(v3.eq.99.99) v3 = 0.0
      if(v4.eq.99.99) v4 = v4m1
      v1m1 = v1
```

```
      v2m1 = v2
      v4m1 = v4
      TMAX(I,J) = V1
      TMIN(I,J) = V2
      RAIN(I,J) = V3
      RAD(I,J) = V4
      IF(RAD(I,J) .GT. RC(J)) RAD(I,J)=RC(J)
  7   CONTINUE
 103  format(3i2,2f6.1,f6.2,6x,f6.2)
C 103  FORMAT(10X,4F10.2)
C103  FORMAT(2X,I4,2I3,F8.2,2F8.0,8X,F8.0)
      WRITE(kw,104)
104   FORMAT('1',///,5X,'MAXIMUM TEMPERATURE',/)
      CALL MSD(NYRS,TMAX,RAIN,1,XDATA,T)
      WRITE(kw,105)
105   FORMAT('1',///5X,'MINIMUM TEMPERATURE',/)
      CALL MSD(NYRS,TMIN,RAIN,2,XDATA,t2)
      IF(KSD.EQ.1) GO TO 9
      WRITE(kw,106)
106   FORMAT('1',///,5X,'SOLAR RADIATION ',/)
      CALL MSD(NYRS,RAD,RAIN,3,XDATA,t3)
      WRITE(kw,107)
  9   CONTINUE
107   FORMAT('1',///,5X,'PRECIPITATION')
      CALL PPRAIN(RAIN,NYRS,YDATA)
C--PHASE ANGLE SHIFTED BY 180 DEGREES
C--AND SIGNS CHANGED ON AMPLITUDES
      XDATA(02)=XDATA(02)*(-1.0)
      XDATA(04)=XDATA(04)*(-1.0)
      XDATA(10)=XDATA(10)*(-1.0)
      XDATA(12)=XDATA(12)*(-1.0)
      XDATA(14)=XDATA(14)*(-1.0)
C      WRITE(kw,101) (AA(I),I=1,20)
      WRITE(kw,101) TITLE
      WRITE(kw,707)
707   FORMAT(///,1X,'INPUT CARDS FOR THE WEATHER GENERATOR ARE AS FOLLOW
     *S ----------',////)
      WRITE(kw,403)
403   FORMAT(///)
      WRITE(kw,513) (YDATA(1,J),J=1,12)
      WRITE(kw,514) (YDATA(2,J),J=1,12)
      WRITE(kw,515) (YDATA(3,J),J=1,12)
      WRITE(kw,516) (YDATA(4,J),J=1,12)
      WRITE(kw1,613) (YDATA(1,J),J=1,12)
      WRITE(kw1,613) (YDATA(2,J),J=1,12)
      WRITE(kw1,613) (YDATA(3,J),J=1,12)
      WRITE(kw1,613) (YDATA(4,J),J=1,12)
513   FORMAT('INPUT #  3 P(W/W) ',12F6.3)
514   FORMAT('INPUT #  4 P(W/D) ',12F6.3)
515   FORMAT('INPUT #  5 ALPHA  ',12F6.3)
516   FORMAT('INPUT #  6 BETA   ',12F6.3)
613   format(12f6.3)
      WRITE(6,400)
400   FORMAT(////)
      WRITE(kw,701)
      WRITE(kw,501) XDATA(01)
      WRITE(kw,502) XDATA(02)
      WRITE(kw,503) XDATA(03)
      WRITE(kw,504) XDATA(04)
      write(kw,5504) t
```

```
701   FORMAT(5X,'INPUT #  7 ----',/)
501   FORMAT(15X,' 1    TXMD     ----   ',F10.3)
502   FORMAT(15X,' 2    ATX      ----   ',F10.3)
503   FORMAT(15X,' 3    CVTX     ----   ',F10.3)
504   FORMAT(15X,' 4    ACVTX    ----   ',F10.3)
5504  FORMAT(15X,' 5    PHTX     ----   ',F10.3)
      write(kw1,614) (xdata(j),j=1,4),T
 614  format(5f8.3)
      WRITE(kw,702)
702   FORMAT(//,5X,'INPUT #  8 ----',/)
      WRITE(kw,505) XDATA(05)
505   FORMAT(15X,' 5    TXMW     ----   ',F10.3)
      write(kw1,614) xdata(5)
      WRITE(kw,703)
703   FORMAT(//,5X,'INPUT #  9 ----',/)
      WRITE(kw,506) XDATA(09)
      WRITE(kw,507) XDATA(10)
      WRITE(kw,508) XDATA(11)
      WRITE(kw,509) XDATA(12)
506   FORMAT(15X,' 6    TN       ----   ',F10.3)
507   FORMAT(15X,' 7    ATN      ----   ',F10.3)
508   FORMAT(15X,' 8    CVTN     ----   ',F10.3)
509   FORMAT(15X,' 9    ACVTN    ----   ',F10.3)
      write(kw1,614) (xdata(j),j=9,12)
      WRITE(kw,704)
704   FORMAT(//,5X,'INPUT # 10 ----',/)
      if(ksd.ne.1) go to 973
      xdata(13) = 450.
      xdata(14) = 190.
      xdata(17) = 290.
      write(kw1,615)xdata(13),xdata(14)
      write(kw1,617)xdata(17)
615   format(2f8.3,5x,'DEFAULT VALUES')
617   format(f8.3,13x,'DEFAULT VALUES')
      write(kw,616)
616   format('***DEFAULT VALUES DUE TO MISSING SOLAR RADIATION DATA***'
     *)
973   continue
      WRITE(kw,510) XDATA(13)
      WRITE(kw,511) XDATA(14)
510   FORMAT(15X,'10    RMD      ----   ',F10.3)
511   FORMAT(15X,'11    AR       ----   ',F10.3)
      WRITE(kw,705)
705   FORMAT(//,5X,'INPUT # 11 ----',/)
      WRITE(kw,512) XDATA(17)
512   FORMAT(15X,'12    RMW      ----   ',F10.3)
      if(ksd.eq.1) go to 974
      write(kw1,614) xdata(13),xdata(14)
      write(kw1,614) xdata(17)
974   continue
      STOP
      END
      SUBROUTINE FOUR(XM,SD,CV,XDATA,t)
      DIMENSION XM(13),SD(13)
      DIMENSION CV(13)
      DIMENSION XDATA(30)
      DATA KW /6/
      DATA JCT /0/
      S = 0.
      S1 = 0.
```

```
      S2 = 0.
      WRITE(kw,200)
200   FORMAT(//,3X,'    PERIOD   MEAN    STD DEV      CV')
      DO 10 I = 1,13
      WRITE(kw,201)I,XM(I),SD(I),CV(I)
201   FORMAT(I10,3F10.2)
      S = S + XM(I)
      S1 = S1 + SD(I)
      S2 = S2 + CV(I)
10    CONTINUE
      XBAR=S/13.
      XBAR1=S1/13.
      XBAR2=S2/13.
      SUMA = 0.
      SUMB = 0.
      SUMA1 = 0.
      SUMB1 = 0.
      SUMA2=0.
      SUMB2 = 0.
      DO 15 K = 1,13
      XK = K
      SUMA=SUMA+(XM(K)-XBAR)*COS(6.2832*XK/13.)
      SUMA1=SUMA1+(SD(K)-XBAR1)*COS(6.2832*XK/13.)
      SUMA2=SUMA2+(CV(K)-XBAR2)*COS(6.2832*XK/13.)
      SUMB=SUMB+(XM(K)-XBAR)*SIN(6.2832*XK/13.)
      SUMB1=SUMB1+(SD(K)-XBAR1)*SIN(6.2832*XK/13.)
      SUMB2=SUMB2+(CV(K)-XBAR2)*SIN(6.2832*XK/13.)
15    CONTINUE
      A = SUMA*(2./13.)
      A1= SUMA1*(2./13.)
      A2 = SUMA2*(2./13.)
      B = SUMB*(2./13.)
      B1 = SUMB1*(2./13.)
      B2 = SUMB2*(2./13.)
      T = ATAN(-B/A)
      T1= ATAN(-B1/A1)
      T2=ATAN(-B2/A2)
      C = A/COS(T)
      C1 = A1/COS(T1)
      C2 = A2/COS(T2)
      WRITE(kw,100)
100   FORMAT(/,'FOURIER COEFFICIENTS--MEAN')
      WRITE(kw,101) XBAR,C,T
101   FORMAT('MEAN =',F10.4,5X,'AMPLITUDE =',F10.4,5X,'PHASE =',
     *F10.4)
      t=(3.1416+t)*58.091
      JCT=JCT+1
      XDATA(JCT)=XBAR
      JCT=JCT+1
      XDATA(JCT)=C
      WRITE(kw,102)
102   FORMAT(/,'FOURIER COEFFICIENTS--STD. DEV.')
      WRITE(kw,101)XBAR1,C1,T1
      WRITE(kw,103)
  3   FORMAT(/,'FOURIER COEEFICIENTS--CV')
      WRITE(kw,101) XBAR2,C2,T2
      JCT=JCT+1
      XDATA(JCT)=XBAR2
      JCT=JCT+1
      XDATA(JCT)=C2
```

Daw

13 - 28 day periods

Daw 6/8


```
      RETURN
      END
      SUBROUTINE MSD(NYRS,W,RAIN,ID,XDATA,t)
      DIMENSION W(105,365),RAIN(105,365),XM(13),XM1(13),SD(13),SD1(13)
      DIMENSION CX(13),CX1(13)
      DIMENSION XDATA(30)
      DATA KW /6/
      DO 20 I = 1,13
      NF=I*28
      NI=NF-27
      XN = 0.
      XN1 = 0.
      SUM = 0.
      SUM1 = 0.
      SS = 0.
      SS1 = 0.
      DO 15 JD=NI,NF
      DO 15 JY = 1,NYRS
      IF(ID .EQ. 2) GO TO 11
      IF(RAIN(JY,JD))11,11,12
11    CONTINUE
      XN = XN + 1.
      SUM = SUM+W(JY,JD)
      SS = SS + (W(JY,JD)*W(JY,JD))
      GO TO 15
12     CONTINUE
      XN1 = XN1 + 1.
      SUM1 = SUM1 + W(JY,JD)
      SS1=SS1+(W(JY,JD)*W(JY,JD))
      CONTINUE
      IF(XN .LE. 2.) XM(I) = 0.
      IF(XN .LE. 2.) SD(I) = 0.
      IF(XN .LE. 2.) CX(I) = 0.
      IF(XN .LE. 2.) GO TO 400
      XM(I) = SUM / XN
      SD(I) = SQRT((SS-SUM*SUM/XN)/(XN-1.))
      IF(XM(I) .LT. 0.001) XM(I) = 0.001
      CX(I) = SD(I) / XM(I)
400   CONTINUE
      IF(ID .EQ. 2) GO TO 20
      IF(XN1 .LE. 2.) XM1(I)=0.
      IF(XN1 .LE. 2.) SD1(I) = 0.
      IF(XN1 .LE. 2.) CX1(I) = 0.
      IF(XN1 .LE. 2.) GO TO 500
      XM1(I) = SUM1 / XN1
      SD1(I)=SQRT((SS1-SUM1*SUM1/XN1)/(XN1-1.))
      IF(XM1(I) .LT. 0.001) XM1(I) = 0.001
      CX1(I)=SD1(I)/XM1(I)
500   CONTINUE
20    CONTINUE
      IF(ID .EQ. 2) GO TO 25
      WRITE(kw,100)
100   FORMAT(10X,'DRY DAYS')
      CALL FOUR(XM,SD,CX,XDATA,t)
      WRITE(kw,101)
101   FORMAT(/,10X,'WET DAYS')
      CALL FOUR(XM1,SD1,CX1,XDATA,t)
      GO TO 30
25    WRITE(kw,102)
102   FORMAT(10X,'WET AND DRY DAYS')
```

DAW 7/4


```
      CALL FOUR(XM,SD,CX,XDATA,t)
30    CONTINUE
      RETURN
      END
      SUBROUTINE PPRAIN(XRAIN,NYR,YDATA)
      DIMENSION XRAIN(105,365)
      DIMENSION NWD(12),NDD(12),NDW(12),NWW(12)
      DIMENSION SUM(12),SUM2(12),SUM3(12)
      DIMENSION SL(12),PWW(12),PWD(12),RBAR(12)
      DIMENSION ALPHA(12),BETA(12)
      DIMENSION NW(12),IC(12),SUML(12)
C      DIMENSION RLBAR(12),AL2(12),BE2(12),DATE(12)
      DIMENSION RLBAR(12),DATE(12)
      DIMENSION PPPW(12),ND(12)
      DIMENSION YDATA(4,12)
      CHARACTER *36 A(2)
      DATA DATE /'JAN.','FEB.','MAR.','APR.','MAY ','JUNE',
     *           'JULY','AUG.','SEP.','OCT.','NOV.','DEC.'/
      DATA A(1) /'                                    '/
      DATA A(2) /'NOT ENOUGH DATA TO DEFINE PARAMETERS'/
      DATA KW /6/
      DO 10 I =1,12
      ND(I) = 0
      PPPW(I) = 0.
      NWD(I) = 0
      NWW(I) = 0
      NDD(I) = 0
      NDW(I) =0
      NW(I) = 0
      SL(I) = 0.
      SUML(I) = 0.
      SUM(I) = 0.
      SUM2(I) = 0.
      PWW(I) = 0.
      PWD(I) = 0.
      ALPHA(I) = 0.
      BETA(I) = 0.
10    SUM3(I) = 0.
      XYR=NYR
      RIM1 = 0.
      DO 20 J = 1,NYR
      DO 30 K = 1,365
      IF(K .GE. 001 .AND. K .LE. 031) MO = 1
      IF(K .GE. 032 .AND. K .LE. 059) MO = 2
      IF(K .GE. 060 .AND. K .LE. 090) MO = 3
      IF(K .GE. 091 .AND. K .LE. 120) MO = 4
      IF(K .GE. 121 .AND. K .LE. 151) MO = 5
      IF(K .GE. 152 .AND. K .LE. 181) MO = 6
      IF(K .GE. 182 .AND. K .LE. 212) MO = 7
      IF(K .GE. 213 .AND. K .LE. 243) MO = 8
      IF(K .GE. 244 .AND. K .LE. 273) MO = 9
      IF(K .GE. 274 .AND. K .LE. 304) MO = 10
      IF(K .GE. 305 .AND. K .LE. 334) MO = 11
      IF(K .GE. 335 .AND. K .LE. 365) MO = 12
      RAIN=XRAIN(J,K)
      IF(RAIN .GT. 0.00) NW(MO)=NW(MO)+1
      ND(MO)=ND(MO)+1
      IF(RAIN) 5,5,3
  3   IF(RIM1)2,2,4
2     NWD(MO)=NWD(MO)+1
```

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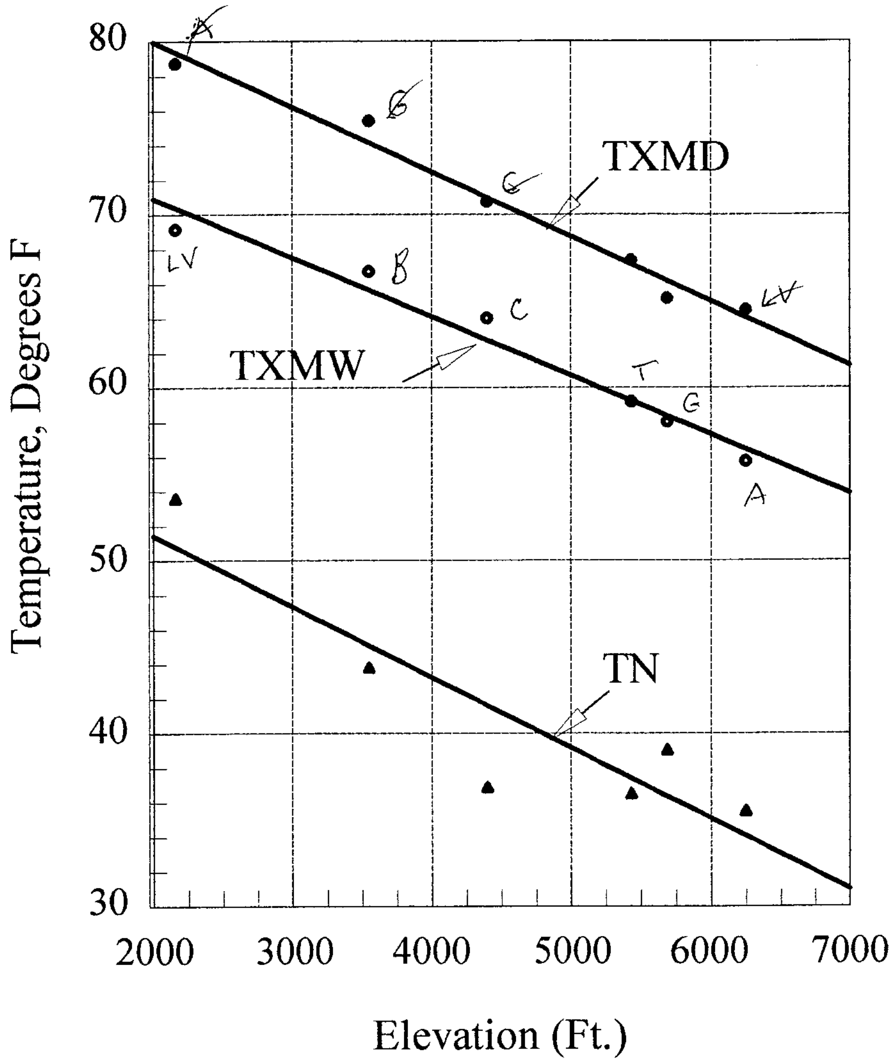
```
      GO TO 6
4     NWW(MO)=NWW(MO)+1
6     CONTINUE
      SUML(MO)=SUML(MO)+ALOG(RAIN)
      SUM(MO)=SUM(MO)+RAIN
      SUM2(MO)=SUM2(MO) + RAIN * RAIN
      SUM3(MO)=SUM3(MO)+RAIN*RAIN*RAIN
      SL(MO) = SL(MO)+ALOG(RAIN)
      GO TO 9
5     IF(RIM1) 7,7,8
 7    NDD(MO)=NDD(MO)+1
      GO TO 9
8     NDW(MO)=NDW(MO)+1
9     RIM1 = RAIN
30    CONTINUE
20    CONTINUE
      DO 120 I = 1,12
      XXND=ND(I)
      YYNW=NW(I)
      PPPW(I) = YYNW/XXND
      III=1
      IF(NW(I) .LT. 3) III=2
      IC(I) = III
      IF(NW(I) .LT. 3) GO TO 120
      XNWW=NWW(I)
      XNWD=NWD(I)
      XXNW=NWW(I)+NDW(I)
      XND=NDD(I)+NWD(I)
      XNW=NW(I)
      PWW(I)=XNWW/XXNW
      PWD(I)=XNWD/XND
      RBAR(I)=SUM(I)/XNW
      RLBAR(I)=SUML(I)/XNW
      Y=ALOG(RBAR(I))-RLBAR(I)
      ANUM=8.898919+9.05995*Y+0.9775373*Y*Y
      ADOM=Y*(17.79728+11.968477*Y+Y*Y)
      ALPHA2=ANUM/ADOM
      IF(ALPHA2 .GE. 1.0) ALPHA2=0.998
      BETA2=RBAR(I)/ALPHA2
      ALPHA(I)=ALPHA2
      BETA(I)=BETA2
 120  CONTINUE
      WRITE(kw,201)
201   FORMAT(///,8X,'--MARKOV CHAIN--                  -GAMMA DIST-',/,
     *1X,' MONTH  P(W/W)    P(W/D)                ALPHA   BETA',/)
      DO 130 I = 1,12
      WRITE(kw,202)DATE(I),PWW(I),PWD(I),ALPHA(I),BETA(I),A(IC(I))
202   FORMAT(1X,A4,F8.3,F10.3,11X,F11.3,F7.3,5X,A36)
130   CONTINUE
      DO 400 J=1,12
      YDATA(1,J)=PWW(J)
      YDATA(2,J)=PWD(J)
      YDATA(3,J)=ALPHA(J)
      YDATA(4,J)=BETA(J)
   )  CONTINUE
      RETURN
      END

--===================_927174474==_
```

Temple, Texas Weather Data for year 1982-1996

Date starts on Jan 1

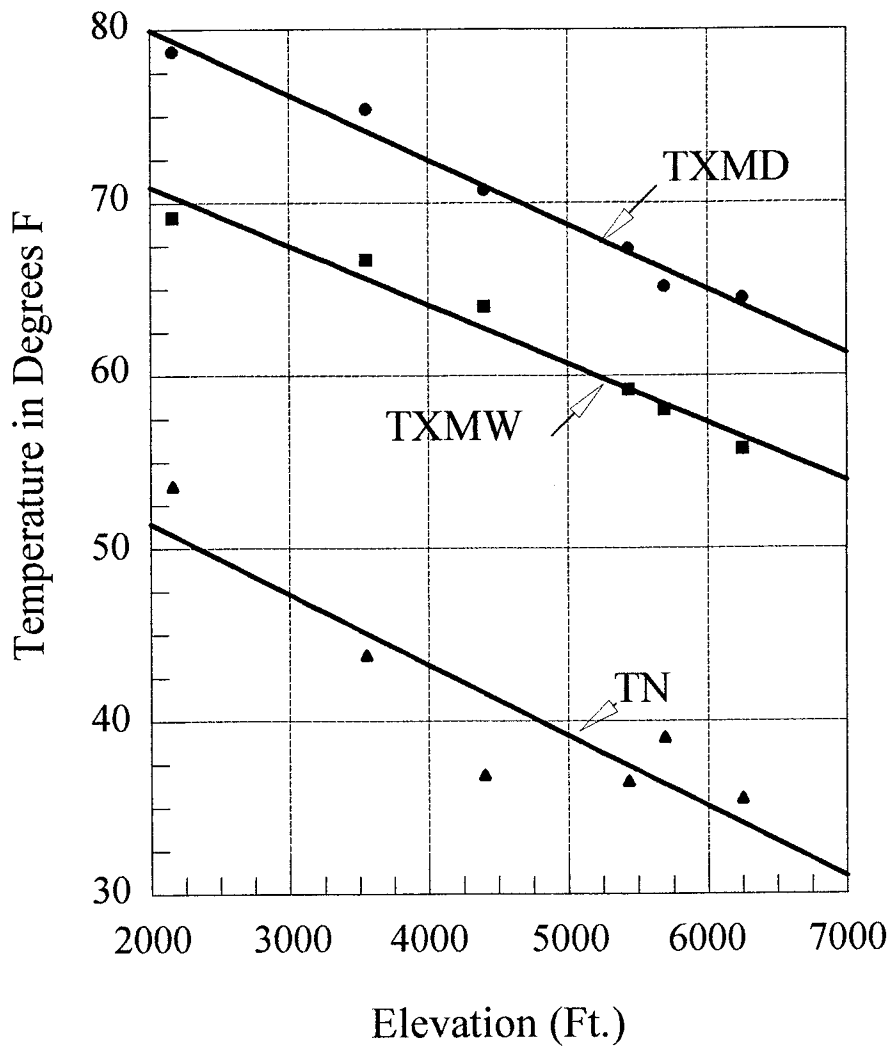
	15	31.05		
1 182	60.1	34.0	.00	296.36
282	75.0	54.0	.00	139.10
1 382	73.9	53.1	.00	273.42
1 482	62.1	37.9	.01	332.45
1 582	69.1	33.1	.00	316.44
1 682	75.9	50.0	.00	290.38
1 782	50.0	28.9	.00	171.12
1 882	46.9	24.1	.00	319.54
1 982	60.1	28.9	.00	321.45
11082	45.0	10.0	.00	321.45
11182	28.0	7.0	.00	293.49
11282	43.0	24.1	.33	135.27
11382	25.0	15.1	.09	104.20
11482	46.0	16.0	.00	352.52
11582	66.9	30.0	.00	339.38
11682	41.0	17.1	.00	295.40
11782	37.9	12.0	.00	322.41
11882	73.0	35.1	.00	329.58
11982	72.0	41.0	.00	275.33
12082	73.9	63.0	.01	161.32
12182	70.0	61.0	.00	53.06
12282	75.9	51.1	.00	158.22
12382	52.0	30.9	.00	358.50
12482	66.0	30.9	.00	346.55
12582	64.0	44.1	.00	319.54
12682	61.0	30.9	.00	368.54
12782	68.0	37.0	.00	230.40
12882	69.1	43.0	.00	334.36
12982	72.0	62.1	.00	115.20
13082	66.9	42.1	.00	101.10
13182	53.1	35.1	.33	389.57
2 182	55.9	30.0	.00	281.30
2 282	61.0	45.0	.11	248.32
2 382	37.9	28.0	.00	159.17
2 482	37.0	27.0	.00	136.23
2 582	34.0	21.0	.05	48.99
2 682	33.1	15.1	.00	302.33
2 782	43.0	25.0	.00	278.43
2 882	46.9	37.0	.06	85.08
2 982	45.0	23.0	.00	390.53
21082	44.1	23.0	.00	272.46
21182	57.0	28.9	.00	361.61
21282	69.1	33.1	.00	359.46
21382	39.9	27.0	.00	253.34
21482	59.0	30.0	.00	264.33
21582	73.0	51.1	.00	238.28
21682	80.1	48.9	.00	436.65
21782	84.9	46.9	.00	431.63
21882	68.0	42.1	.00	347.51
21982	66.9	45.0	.00	271.27
22082	61.0	54.0	.17	215.34
22182	79.0	48.9	.00	466.77
	V1	V2	V3	V4

DAW



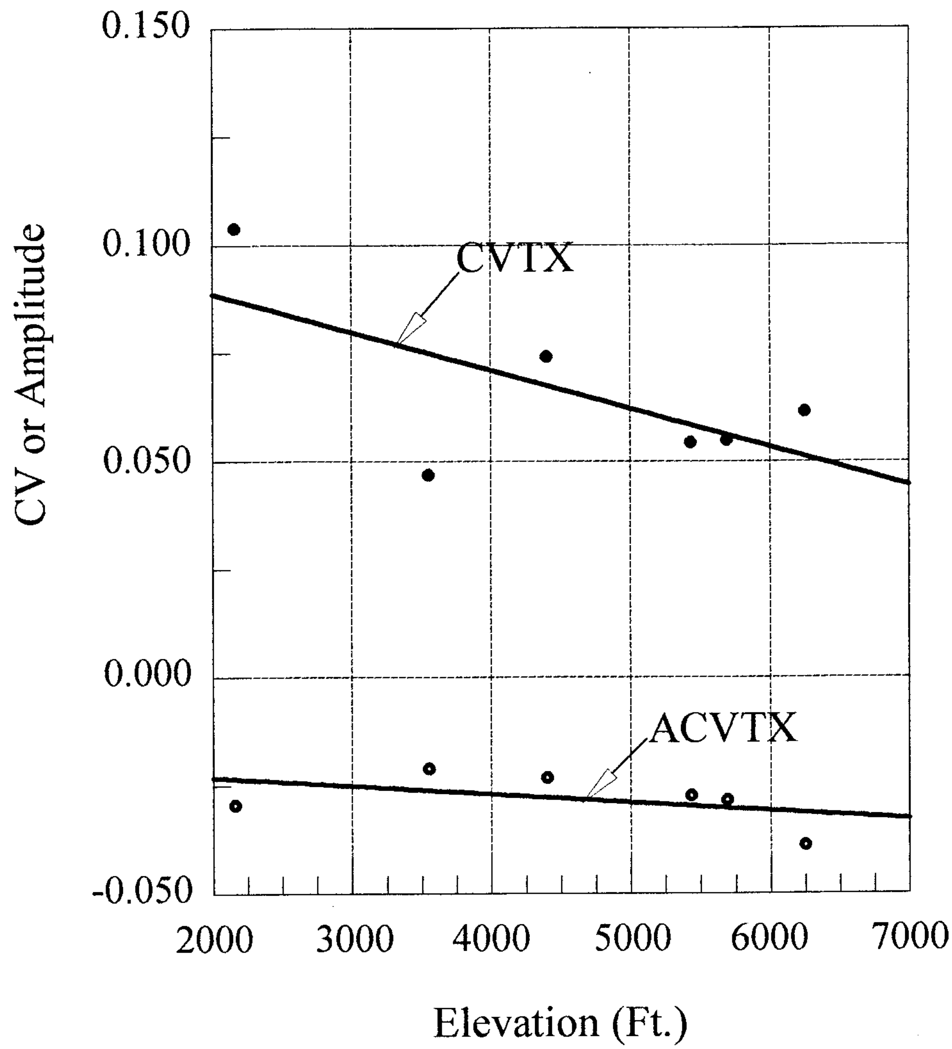
TEMPSTAT.PGW DAW 6/9/99

Tempstat.pdw



TEMP.PGW DAW 6/9/99

DAW



TEMPCVTX.PGW DAW 6/9/99

SUMMARY OF MIXEX2000 RUNS C16-C21

Four harmonics for Markov Chain Parameters. Alpha optimized, Two harmonics for Beta, Three harmonics for the mean daily precipitation given a wet day. DAW 1-21-2000 FILE: CLIMATE\Summary1.wpd

: STATION NUMBER 260046 ADAVEN Run C21

Mean of alpha before optimization = 0.279512

FINAL LOG-LIKELIHOOD VALUE=-F= 436.09814

PARAMETER	MEAN	AMP	PAN	AMP	PAN		
ALFA	0.15440						
BETA	0.67243E-01	0.22164E-01	-1.7430	0.77122E-03	5.3109		
MEAN	0.28716	0.67838E-01	-2.6423	0.35359E-01	0.22040	0.14954E-01	-3.8209

conversions from inches to mm. 1.708, 0.563, 0.0196 mm. 7.294, 1.723, 0.899, 0.380, ~2.462.

****

: STATION NUMBER 260718 BEATTY8N Run C19

Mean of alpha before optimization = 0.350364

FINAL LOG-LIKELIHOOD VALUE=-F= 620.78119

PARAMETER	MEAN	AMP	PAN	AMP	PAN		
ALFA	0.32741						
BETA	0.40053E-01	-0.23393E-02	-2.0150	0.18011E-01	3.0356		
MEAN	0.17597	0.19679E-01	3.1388	0.27261E-01	1.8101	0.12525E-01	0.45835

1.019 mm, + 0.0594 mm, 1.126 ✓, = -3.144, 0.457. 4.47 mm, 0.500, 0.692, 0.318.

****

: STATION NUMBER 261358 CALIENTE Run C20

Mean of alpha before optimization = 0.213767

FINAL LOG-LIKELIHOOD VALUE=-F= 1641.54407

PARAMETER	MEAN	AMP	PAN	AMP	PAN		
ALFA	0.14383						
BETA	0.10050E-01	0.43232E-02	-1.3439	0.37392E-02	-0.37800		
MEAN	0.17488	0.34353E-01	-2.1941	0.14331E-01	-0.11906	0.52707E-03	5.2584

0.254, 0.110, 0.095, ~5.905. 4.44, 0.8725, 0.364, ~6.1641, 0.0134, ~1.02.

WORD PERFECT. CLIMATE\SUMMARYMC

DAW

ADAVEN MARKOV CHAIN AMPS & PHASE ANGLES (ADAVEN4.MCP)

2.3819	0.36420	0.37052	0.33419	0.22590	.0
0.0000	-1.6064	-.77698	2.5482	-.47310	.0
0.55822	0.17989	0.16553	0.23534	0.29469	.0
0.0000	-1.2667	-.50407	2.3300	-.61901	.0

BEATTY8N MARKOV CHAIN AMPLITUDES AND PHASE ANGLES 4 HARMONICS

2.7511	0.48574	0.29087	0.17459	0.39786
0.0000	-1.2549	-1.2489	2.1432	-.76458
0.67330	0.25265	0.19815	0.13475	0.93316E-01
0.0000	-1.6849	-.84431	-.18030	2.5517

Caliente Markov Chain Amplitudes and Phase angles (CALIEN4.OUT)

2.3243	0.22288	0.38381	0.30365	0.36045
0.0000	-1.4470	-.76353	2.4941	-.34840
0.36226	0.16423E-01	0.12902	0.55821E-01	0.75858E-01
0.0000	-1.3244	-2.4432	2.2575	2.3834

GOLDFIELD MC AMPLITUDES AND PHASE ANGLES (GOL4.MCP)

2.7418	0.36363	0.26168	0.28914	0.36333
0.0000	-1.8682	-.99035	2.3544	-.77460
0.73884	0.41390E-01	0.28228	0.25068	0.18313
0.0000	2.9089	-.10338	-.82215	-.70106

TONOPAH MC AMPLITUDES AND PHASE ANGLES (TON4.MCP) FROM TONOPA4.OUT

2.5885	0.21903	0.23607	0.23945	0.37065
0.0000	-1.7080	-.94035	2.4147	-.72411
0.57021	0.31977E-01	0.15006	0.22222	0.20179E-01
0.0000	-1.0422	-.77094	-.48563	0.11229

LAS VEGAS MC AMPLITUDES AND PHASE ANGLES (VEG4.MCP) FROM VEGAS4.OUT

2.9128	0.33880	0.50975	0.35487	0.33495
0.0000	-.65039	-.99029	2.7165	-.48979
0.90554	0.29772	0.25580	0.57257E-01	0.24337
0.0000	-.68118	-.81057	2.7144	2.3980

: STATION NUMBER 263285 GOLDFIELD Run C16 (Rerun)

Mean of alpha before optimization = 0.356002

FINAL LOG-LIKELIHOOD VALUE=-F= 613.81427

PARAMETER	MEAN	AMP	PAN	AMP	PAN	AMP	PAN
ALFA	0.33287						
	1.344	0.746	-1.1785	0.570			
BETA	0.52928E-01	0.96944E-02	5.1045	0.22432E-01	0.36756		
	5.31	1.245		1.129		1.546	
MEAN	0.20904	0.49021E-01	-2.0018	0.44465E-01	0.57591	0.60882E-01	-3.3446

****

: STATION NUMBER 268170 TONOPAH Run C17

Mean of alpha before optimization = 0.323169

FINAL LOG-LIKELIHOOD VALUE=-F= 1712.73584

PARAMETER	MEAN	AMP	PAN	AMP	PAN	AMP	PAN
ALFA	0.25966						
	0.361	0.0014	1.044	0.0287			
BETA	0.14217E-01	0.54713E-04	-5.2390	0.11297E-02	-0.21891		
	3.56	0.831		0.424		0.312	
MEAN	0.14018	0.32714E-01	-1.3301	0.16682E-01	0.43866	0.12276E-01	-3.8849

****

264436 LAS VEGAS WSO AIRPORT Run C18 vegC18.02

Mean of alpha before optimization = 0.328283

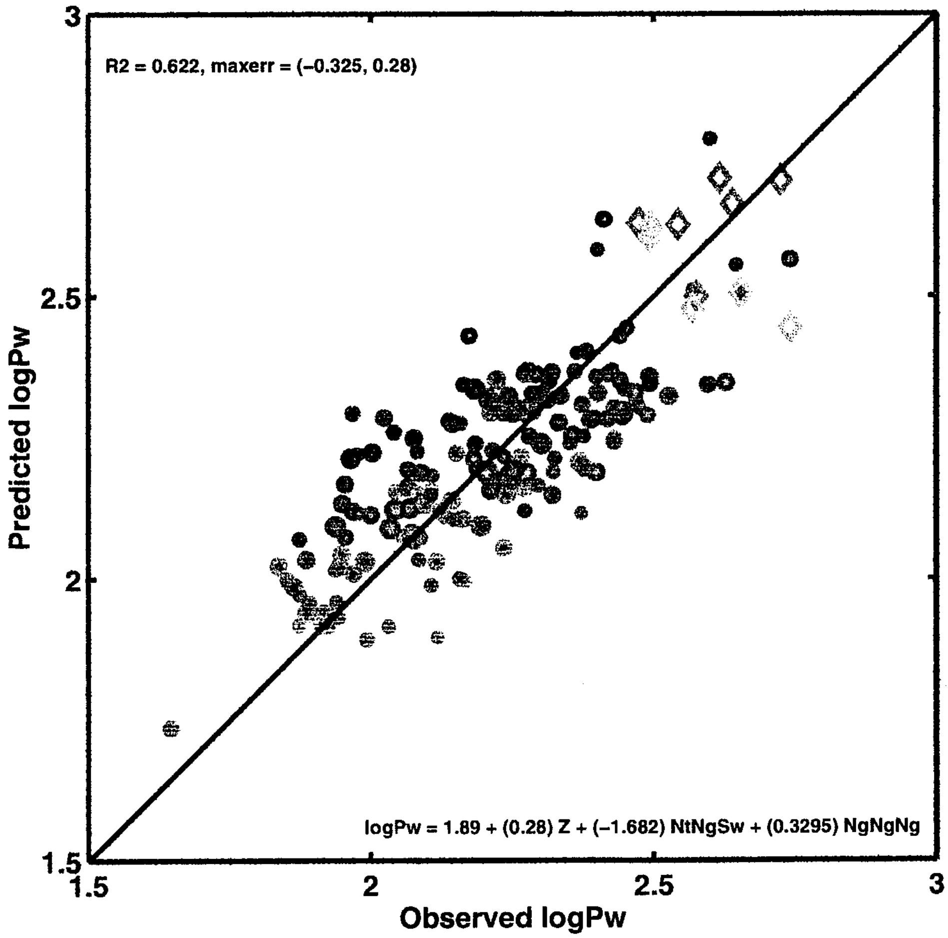
FINAL LOG-LIKELIHOOD VALUE=-F= 1117.51428

PARAMETER	MEAN	AMP	PAN	AMP	PAN	AMP	PAN
ALFA	0.29425						
	0.301	0.164		-.0012			
BETA	0.11864E-01	0.64399E-02	0.48476	-0.46219E-04	2.1934		
	3.835	~~0.334~~ 0.703		0.546		0.141	
MEAN	0.15097	0.27687E-01	-1.7864	0.21515E-01	2.0457	0.55333E-02	-0.35524

Summarized in PSIPLOT sheet MCMEPAR2.POW

.8124

Daw



Plot from Statheff

HAFit_Pw_3_C.pdf

Analysis of Program Structure | CALLING FLOW CHART

← Daw 0. 144

MIXEX

CALL CALCUL p 9
        CALL SORT1I4
        CALL SORT1R4

    CALL ESTADI p 13

    CALL MIXEXP p 14
        CALL ASIMPLX
            FPLIK p 17

    CALL FOUTER
        CALL SERIES
            CALL COEFF

            CALL FOURI p 9

    CALL LIKMEX p 19 — Most likely for errors
        CALL MLIK p 21 looks O.K.

        CALL ASIMPLX
            TOTALIK p 22

RETURN

MSWORD MIXEXDEF.DOC

p 70

CALL A

> 0 N = 2

X(1) = $\overline{\beta}$
X(2) = $\overline{\theta}$
X(3) = 1st am α
X(4) = 1st φ α
X(5) = ~~2 am α~~ α
X(6) = ~~2nd φ α~~ α
X(7) = 3rd am α
X(8) = 3rd φ α
~~etc~~ DAW 4/2/04
X(9) = 1st am β
X(10) = 1st φ β

etc

} if MAX N = 3 > DAW 4/2/04

= 0 N = 3 DAW

X(1) = $\overline{\alpha}$
X(2) = $\overline{\beta}$
X(3) = $\overline{\theta}$
X(4) = 1st am α
X(5) = 1st φ α
etc

Should revise MIXEX so that it reads in the Fourier Coef. for P_{00} and P_{10}

Also write out a file that can be used to create a graph.

DAY P00 P10 PWET α β Θ μ ΣP_T ΣN_T ΣP_0 ΣN_0

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

LIKMEX

ALFA(I), I = 1, 365 mixed exponential parameter for day I.

BETA(I) "

TETA(I) "

CALFA – Input value for α, If CALFA > 0, then α is a constant and is not optimized. This option is used when α is a regional constant.
If CALFA = 0
IN COMMON SEIS

KALFA – Code. If KALFA = 0

if KALFA = 1

Fourier Series

$$f(t) = \frac{a_0}{2} + \sum_{1}^{\infty}\left(a_n \cos\frac{n\pi t}{T} + b_n \sin\frac{n\pi t}{T}\right)$$

or

$$f(t) = \sum_{-\infty}^{\infty} C_n e^{in\pi t/T}$$

MAXA, MAXB, MAXT – Maximum number of harmonics for α, β and θ respectively

MAXH – Maximum number of harmonics considered = MAX(MAXA, MAXB, MAXT)

X(1), X(2), …, X(N) – Parameters to be optimized

If CALFA > 0 N = 2 and X(1) = BEMEAN, X(2) = ($\bar{\mu}$)

If CALFA = 0 N = 3 and X(1) = ALMEAN, X(2) = BEMEAN, X(3) = $\bar{\mu}$

SUBROUTINES — DAW — 148

√ ASIMPLX (SXFUNC, NPAR, ITMAX, PAREPS, FNEPS, STEP KIST, IP, A)

√ AMP_FAZE (PAR, AM, PH) — May not be used

√ CALCUL

√ COEFF (F, NSTUDY, AMP, PAN, YMEAN, MAXH)

√ ESTADI

√ FOURI (IPR)

√ FOUTER (NSTUDY) —

√ FPLIK (N, X, F)

√ LIKMEX

√ MLIK

√ MIXEXP

√ SERIES

√ TOTALIK (N, X, F)

√ SORT1I4 (R, N, IDR)

√ SORT1R4 (R, N, IDR)

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

CALFA 1

p 15 in SUB MIXEXP

ORMOM1(I)=

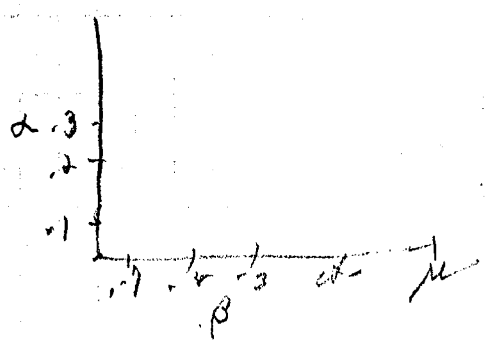
OA = CALFA

$$f(x) = \alpha \frac{e^{x/\beta}}{\beta} + (1-\alpha)\frac{e^{x/\theta}}{\theta}$$

$$\mu = \alpha\beta + (1-\alpha)\theta$$

$$\beta = 0.1\mu$$

$$\mu = \alpha[0.1\mu] + (1-\alpha)\theta \qquad \theta = \frac{\mu - \alpha(0.1\mu)}{1-\alpha}$$



Sub FPLIK looks O.K. but not sure of the function of KALFA

It appears that, if KALFA = 1 then CALFA (input) = 0

And CALFA is used to calculate the average of α for all periods

KALFA	CALPHA 0	>0
0		MAXA = 0
1	MAXA = 0	~~MAXA = 0~~ should not be used DAW 4/2/04

Problem with SORT1I4 (NTEMP, NCOUNT, -1)

NTEMP(L) L = 1 → NCOUNT # of years

Trying to get CDF of # of wet days per period as specified by NUMSAV

NTEMP(
L
1 n_1
2 n_2
:
N
NCOUNT N_{NCOUNT}

1	0	2
2	10	
3	11	
4	9	
5	2	
6	1	
7	4	
8	8	
9	7	
10	6	

SORT1I4 (R, N, IDR)

# of yrs SH = 10

MC	MPD	LL	L	LR	RN	I	J
1234567		0	1	N(10)	N-1(9)	1	N+1 (11)
0.5	5						10

.03

FR = R(5) R(1)
2 0

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

PAN(I,J) Phase angle in radians

AMP(I,J) Amplitude

	P_{00}? 1	P_{10}? 2	J 3	4	5	6
I						
1			1st Amp α	1st Amp β	1st Amp θ	1st amp μ
2			2nd " α	2nd " β	2nd θ	2nd amp μ
3			3rd α	3rd β	3rd θ	3rd amp μ
4						
5						
6						

MAXH

A(I) parameters to be optimized in ASIMPLX - returned from ASIMPLX

KIST - ~~Parameter~~ DAW 4/7/04 returned from ASIMPLX

IF CALFA > 0 then,

X(3) = AMP(1,3) X(4) = PAN(1,3

X(5) = AMP(2,3) X(6) = PAN(2,3)

X(7) = AMP(3,3) X(8) = PAN(3,3)

P(I, N1) I = 1, N 0 ← DAW

```
* Initial parameters and function value:
* Index  Function value  Function parameters
*   21     -1616.9       0.42231E-01   0.23119     0.0000        0.0000
                          0.0000        0.0000      0.0000        0.0000
                         0.21613E-01  -3.0452     0.10292E-01  -1.2723
                         0.10846E-01  -3.2023     0.37666E-01  -2.3754
                         0.16949E-01   0.19985    0.10403E-02   2.4562

* *** Iteration limit exceeded ***

* Minimal location found:
* Index  Function value  Function parameters
*  1000    -1628.0       0.30856E-01   0.62211   -0.30348E-01   0.46808
                         0.29741E-01  -0.59271   -0.49147E-01   0.71457
                         0.12548E-01  -3.2669     0.82554E-02  -1.9751
                         0.10120E-01  -2.0485     0.31935E-01  -2.2096
                         0.83871E-02   0.13030    0.33215E-03   2.7271
*  Number of function evaluations =   1000

        OPTIMIZED PARAMETERS
     0.03086    0.62211   -0.03035
     0.46808    0.02974   -0.59271
    -0.04915    0.71457    0.01255
    -3.26694    0.00826   -1.97514
     0.01012   -2.04848    0.03193
    -2.20961    0.00839    0.13030
     0.00033    2.72712

   F= -1628.01147KIST=    3

        FINAL LOG-LIKELIHOOD VALUE=-F=   1628.01147
```

N1 Y(N1)

DAW 4/7/04 AMP(1,3)

looks like it is optimizing everything!

1

PARAMETER	MEAN	AMP	PAN	AMP	PAN	
ALFA	0.29800					
BETA	0.30856E-01	0.12548E-01	-3.2669	0.82554E-02	-1.9751	
MEAN	0.44592	0.31935E-01	-2.2096	0.83871E-02	0.13030	0.

I	TPDD365	TPWD365	ALP1	BET1	THE…	XMU	ACPREM… 8	TDWD365… 9	ACPREM(…) 10	
345	0.8571	0.5456	0.0100	4.5144	2.8664	2.8909	42.65	0.03	46.012	0
346	0.8567	0.5449	0.0100	4.3358	2.7693	2.7929	42.86	0.03	46.593	0
347	0.8562	0.5445	0.0100	4.1486	2.6670	2.6898	43.07	0.03	47.154	0
348	0.8559	0.5443	0.0100	3.9533	2.5597	2.5817	43.27	0.03	47.694	0
349	0.8557	0.5443	0.0100	3.7501	2.4477	2.4687	43.48	0.03	48.211	0
350	0.8556	0.5446	0.0100	3.5395	2.3311	2.3512	43.69	0.03	48.703	0
351	0.8555	0.5452	0.0100	3.3219	2.2102	2.2293	43.90	0.03	49.170	0
352	0.8555	0.5459	0.0100	3.0977	2.0852	2.1033	44.11	0.03	49.611	0
353	0.8557	0.5470	0.0100	2.8674	1.9563	1.9734	44.32	0.03	50.023	0
354	0.8559	0.5482	0.0100	2.6315	1.8238	1.8399	44.53	0.03	50.406	0
355	0.8562	0.5497	0.0100	2.3903	1.6880	1.7030	44.74	0.03	50.760	0
356	0.8566	0.5515	0.0100	2.1445	1.5492	1.5631	44.94	0.03	51.083	0
357	0.8570	0.5534	0.0100	1.8944	1.4075	1.4204	45.15	0.03	51.376	0
358	0.8576	0.5556	0.0100	1.6407	1.2634	1.2752	45.35	0.03	51.637	0
359	0.8582	0.5580	0.0100	1.3839	1.1171	1.1278	45.56	0.03	51.866	0
360	0.8589	0.5606	0.0100	1.1244	0.9689	0.9785	45.76	0.03	52.063	0
361	0.8596	0.5633	0.0100	0.8628	0.8192	0.8276	45.96	0.03	52.229	0
362	0.8604	0.5663	0.0100	0.5997	0.6681	0.6754	46.16	0.03	52.363	0
363	0.8613	0.5694	0.0213	0.3356	0.5182	0.5224	46.35	0.03	52.466	0
364	0.8622	0.5726	0.1676	0.0711	0.4189	0.3687	46.55	0.03	52.537	0
365	0.8632	0.5760	0.3141	0.0100	0.2967	0.2146	46.74	0.03	52.579	0

wrong wrong wrong wrong

Theor Eval diff May be OK DAW 4/1/04

changed

mostly zero

TAMT3W5L

May be OK

Adatest-03

1-10-99 Run 7 Cols 1,2,3,4,5,6,7,8,10 unchanged

9 - changed 10? also

153

DAW

Something [illegible] wrong for the [illegible] input of α [illegible] for individual periods

DAW

OPTIMIZED PARAMETERS

.07126 .17990

F = -101.42070

IST = 2

LOG-L= 101.42070000

ALFA = .31400000

BETA = .07126127

TETA = .17989500

THEORETICAL MEAN PRECIPITATION FOR WET DAYS FOR EACH PERIOD

.1414	.1355	.1565	.1527	.1304	.1694	.1573	.1283	.1461
.1893	.2124	.2336	.2197	.2579	.1583	.2525	.1336	.1636

THEORETICAL PRECIPITATION STD DEV FOR WET DAYS FOR EACH PERIOD

.1827	.1761	.2091	.1876	.1667	.1991	.2085	.1489	.1873
.2412	.2786	.3110	.2197	.3466	.1998	.2992	.1648	.1795

LOG-LIKELIHOOD VALUES FOR MIXED EXPONENTIAL. 14-DAY PERIODS

79.31602	103.31190	69.71939	57.22364	106.54180	58.85901
79.67467	95.78465	92.14661	40.23861	39.10471	37.06954
60.16747	21.37925	72.28218	69.85530	62.45535	91.72600

TOTAL OF THE LOG-LIKLIHOOD VALUES= 1660.52100

A(1) = A0 = (2 X MEAN)

				PHI	C
A(1)=	.62800	B(1)=	.00000	.00000	.00000
A(2)=	.00000	B(2)=	.00000	-2.83313	.00000
A(3)=	.00000	B(3)=	.00000	1.79663	.00000
A(4)=	.00000	B(4)=	.00000	2.08045	.00000
A(5)=	.00000	B(5)=	.00000	2.28080	.00000
A(6)=	.00000	B(6)=	.00000	2.27565	.00000
A(7)=	.00000	B(7)=	.00000	2.24721	.00000
A(8)=	.00000	B(8)=	.00000	2.31241	.00000
A(9)=	.00000	B(9)=	.00000	2.51480	.00000
A(10)=	.00000	B(10)=	.00000	2.55010	.00000
A(11)=	.00000	B(11)=	.00000	2.90136	.00000
A(12)=	.00000	B(12)=	.00000	3.02167	.00000
A(					

A(1) = A0 = (2 X MEAN)

				PHI	C
A(1)=	.08796	B(1)=	-.02204	.00000	.00000
A(2)=	-.00420	B(2)=	.00498	-2.95334	.02244
A(3)=	-.00941	B(3)=	-.00970	-1.08417	.01064
A(4)=	-.00267	B(4)=	.00461	-2.87332	.01006
A(5)=	-.00961	B(5)=	.00709	-1.12384	.01066
A(6)=	.01799	B(6)=	-.01872	1.19548	.01933
A(7)=	.00204	B(7)=	.00572	3.03318	.01883
A(8)=	.00245	B(8)=	-.02072	.40477	.00623
A(9)=	.00855	B(9)=	-.00964	2.75001	.02242
A(10)=	-.02998	B(10)=	.01805	-1.88193	.03149
A(11)=	.00354	B(11)=	-.00736	.19380	.01839
A(12)=	.00718	B(12)=	.00000	2.36863	.01028
A(					

A(1) = A0 = (2 X MEAN)

				PHI	C
A(1)=	.46154	B(1)=	-.02183	.00000	.00000
A(2)=	-.04451	B(2)=	.02095	-2.02675	.04957
A(3)=	.01250	B(3)=	.00147	.53795	.02440
A(4)=	-.00070	B(4)=	-.01000	-.44500	.00163
A(5)=	.00012	B(5)=	.00266	3.12966	.01000
A(6)=	-.00582	B(6)=	.00953	-1.14253	.00639
A(7)=	-.00362	B(7)=	.00142	-.36307	.01019
A(8)=	-.00207	B(8)=	-.00914	-.97075	.00251
A(9)=	-.00665	B(9)=	-.00629	-2.51275	.01131
A(10)=	.01004	B(10)=	.00407	2.13056	.01185
A(11)=	-.01457	B(11)=	.02384	-1.29852	.01513
A(12)=	.01819	B(12)=	.00000	.65159	.02999
A(					

A(1) = A0 = (2 X MEAN)

				PHI	C
A(1)=	.34976	B(1)=	-.02405	.00000	.00000
A(2)=	-.02899	B(2)=	.01545	-2.26348	.03767
A(3)=	.00697	B(3)=	-.00098	.42363	.01695
A(4)=	.00036	B(4)=	-.00803	2.79189	.00104
A(5)=	-.00519	B(5)=	.00817	-2.56756	.00956
A(6)=	-.00012	B(6)=	.00295	-.01517	.00817
A(7)=	-.00125	B(7)=	.00315	-.40177	.00321
A(8)=	-.00245	B(8)=	-.01096	-.66043	.00399
A(9)=	.00039	B(9)=	-.00840	3.10623	.01096
A(10)=	.00022	B(10)=	.00620	3.11554	.00840
A(11)=	-.00881	B(11)=	.01206	-.95764	.01077
A(12)=	.01641	B(12)=	.00000	.93700	.02037
A(					

MEAN OF THE M.E.D. PARAMETERS

ALFA=	.314000
BETA=	.043980
TETA=	.230770
MEAN=	.174878

AMPLITUDE FOR ALFA	.00000	.00000
PHASE ANGLE FOR ALFA	-2.94502	1.57285
AMPLITUDE FOR BETA	.02244	.01064
PHASE ANGLE FOR BETA	-3.06523	-1.30795
AMPLITUDE FOR TETA	.04957	.02440
PHASE ANGLE FOR TETA	-2.13864	.31417
AMPLITUDE FOR MEAN	.03767	.01695
PHASE ANGLE FOR MEAN	-2.37537	.19985

LIKELIHOOD WITH MAXH (LS) HARMONICS 1617.99800

OPTIMIZACION CON TODOS LOS PARAMETROS

ALFA VALUE IS CONSTANT AND IS EQUAL TO .3140

INITIAL PARAMETERS

.04398 .23479

* Simplex nonlinear optimization algorithm *

Linear Regression Report

Data File Name: C:\consult\swri\CLIMATE\MCMEPAR2.PDW

IndVar:	PMM
DepVar:	BMM

Equation: y=a*x+b

Parameter a:	0.0042298210
Parameter b:	0.047096418
Uncertainty da:	0.0033075704
Uncertainty db:	0.65737697
Sum Sqrs:	1.34860652
StdDev:	0.51934700
R-Sq r2:	0.29020208
Correlation:	0.53870407

----Created by David A. Woolhiser with PSI-Plot
----Fri Jan 21 11:47:53 2000

```
=================================================================
          Linear Regression Report

          Data File Name: C:\consult\swri\CLIMATE\MCMEPAR2.PDW

=================================================================

                           IndVar:           PMM    P̄
                           DepVar:         Alpha    ᾱ

  Equation: y=a*x+b

                      Parameter a:  -0.00086764000 ± .000313
                      Parameter b:      0.41291108 ± .06226
                   Uncertainty da:  0.00031325946
                   Uncertainty db:    0.062260067
                        Sum Sqrs:    0.012096938
                          StdDev:    0.049187271
                        R-Sq r2:      0.65727988
                     Correlation:     -0.81072799

=================================================================

    ----Created by David A. Woolhiser with PSI-Plot
    ----Fri Jan 21 11:35:50 2000

=================================================================
```

==

Linear Regression Report

Data File Name: C:\consult\swri\CLIMATE\MCMEPAR2.PDW

==

IndVar:	PMM	P_A (mm)
DepVar:	MUMM	$\bar{\mu}$

Equation: y=a*x+b

Parameter a:	0.014050940	±.00502
Parameter b:	2.21517346	± 0.9978
Uncertainty da:	0.0050204943	
Uncertainty db:	0.99781922	
Sum Sqrs:	3.10713429	
StdDev:	0.78830632	
R-Sq r2:	0.66195700	
Correlation:	0.81360740	

==

----Created by David A. Woolhiser with PSI-Plot
----Fri Jan 21 11:48:52 2000

==

Linear Regression Report

Data File Name: C:\consult\swri\CLIMATE\MCMEPAR2.PDW

IndVar:	PMM
DepVar:	LOGITA

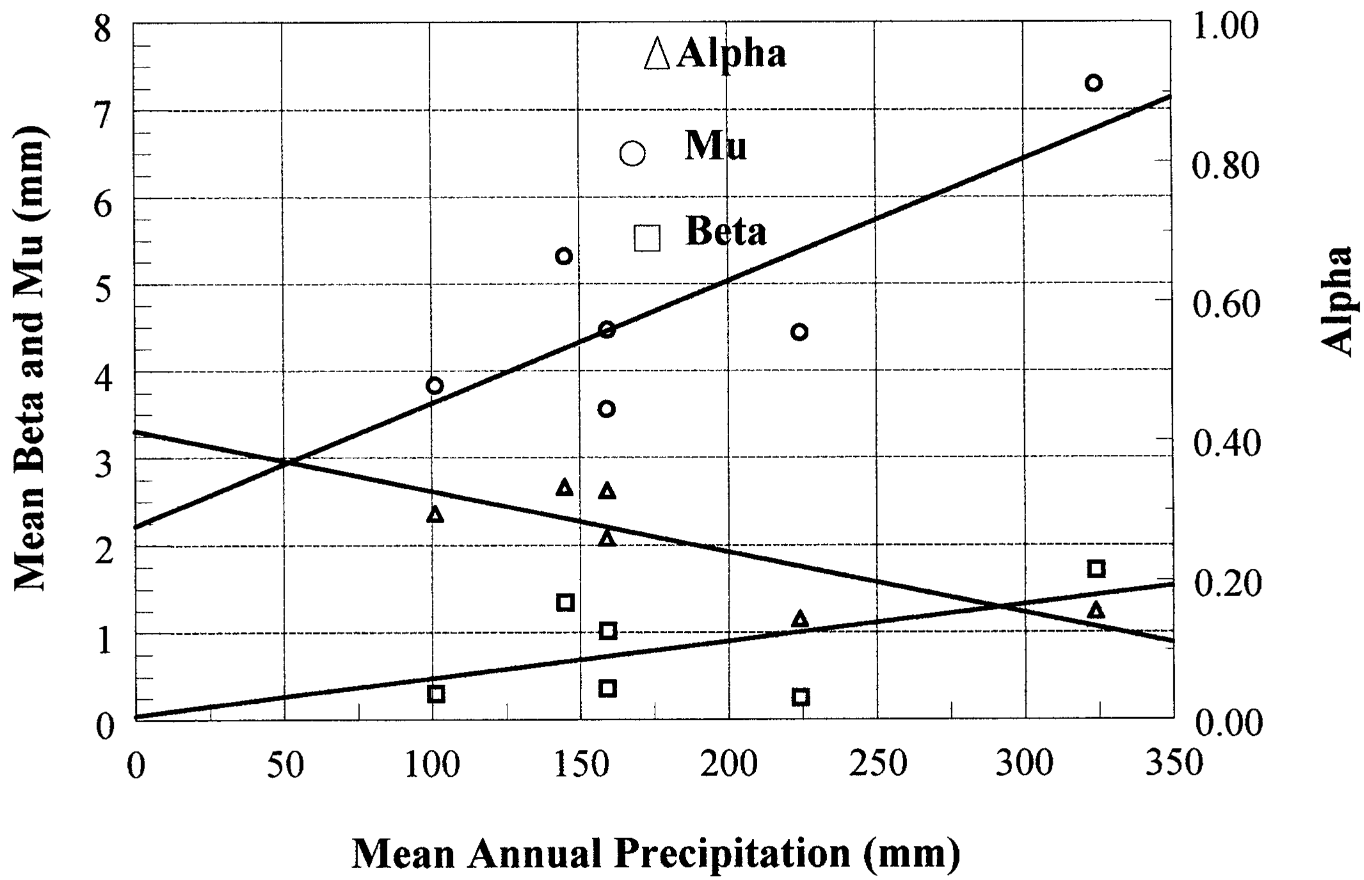
Equation: y=a*x+b

Parameter a:	-0.0050773200 ± .00177
Parameter b:	-0.19578828 ± .352
Uncertainty da:	0.0017724579
Uncertainty db:	0.35227458
Sum Sqrs:	0.38727450
StdDev:	0.27830721
R-Sq r2:	0.67228507
Correlation:	-0.81992992

----Created by David A. Woolhiser with PSI-Plot
----Fri Jan 21 12:06:36 2000

Runs C16-C21; MIXEX2000
DAW 1-21-2000
File: CLIMATECMEPAR2.PGW

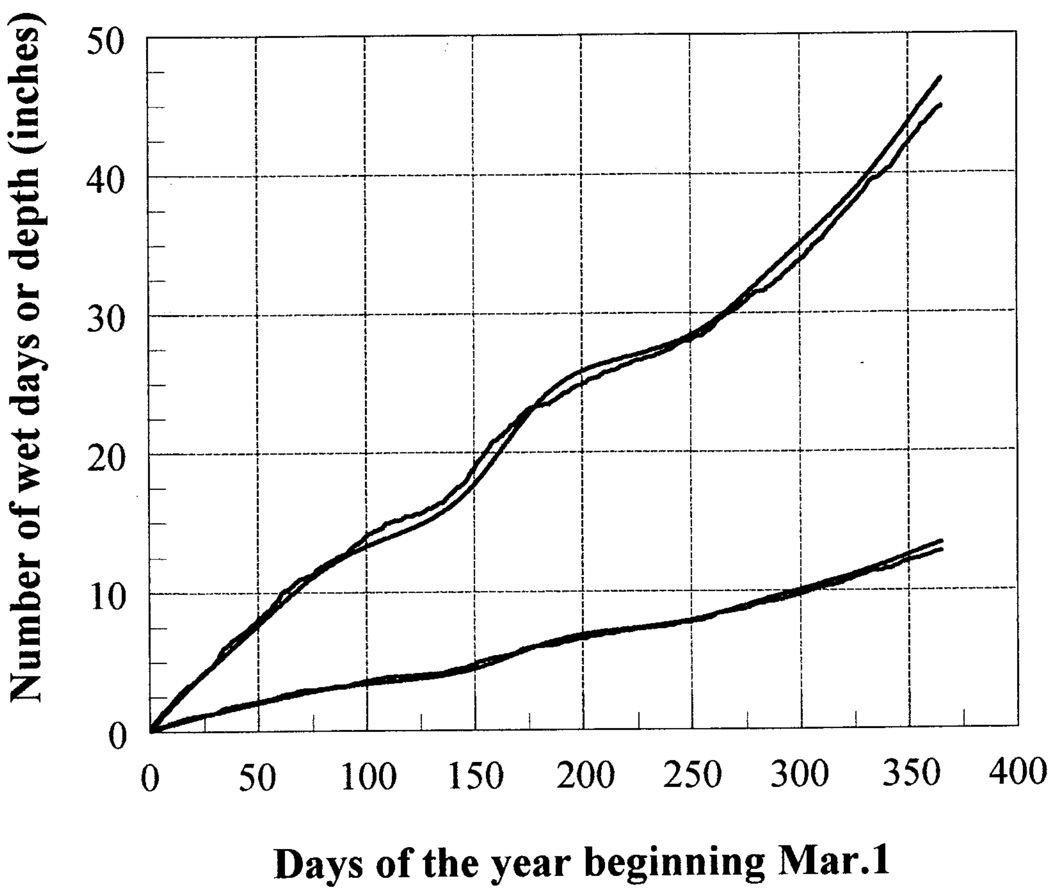
Relation between mean annual parameters
of the ME distribution and mean annual precipitation



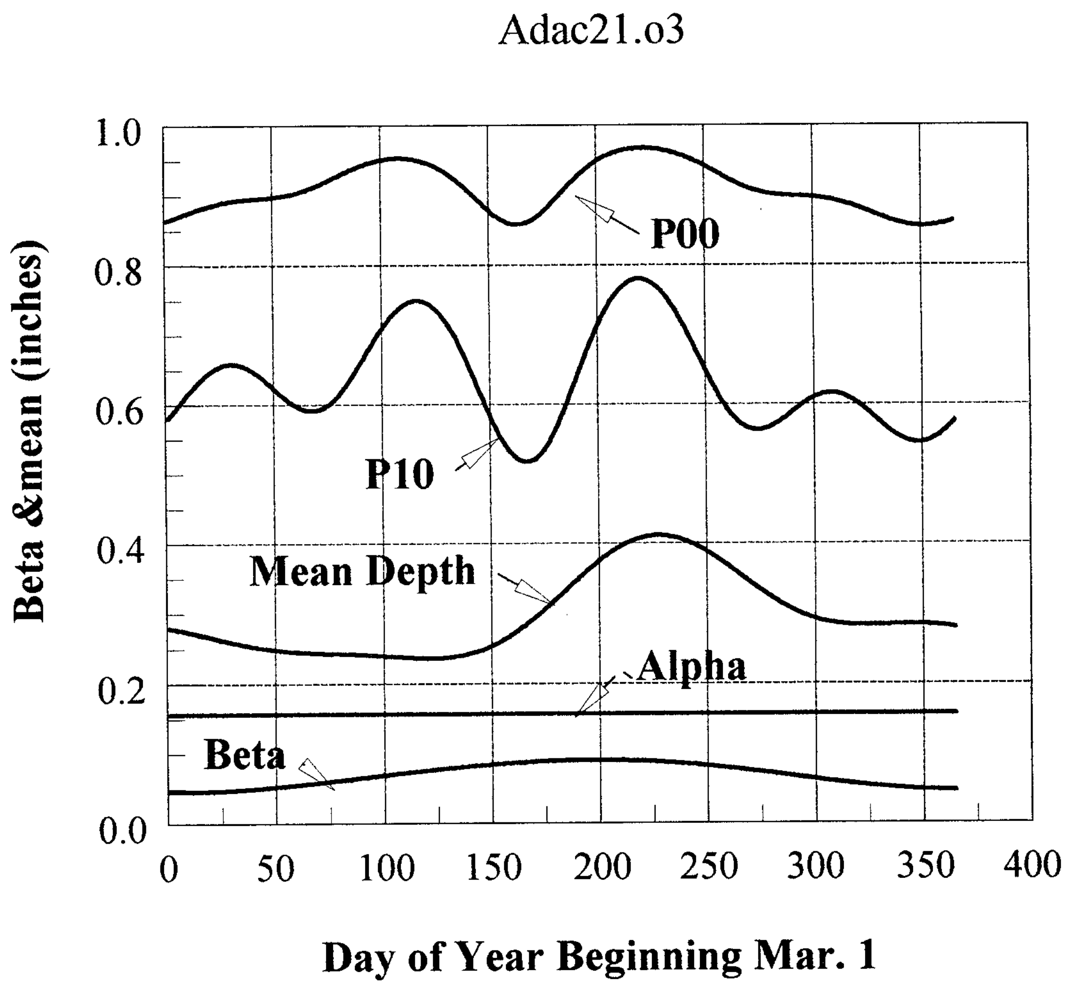
DAW

DAW

Adac21.o3



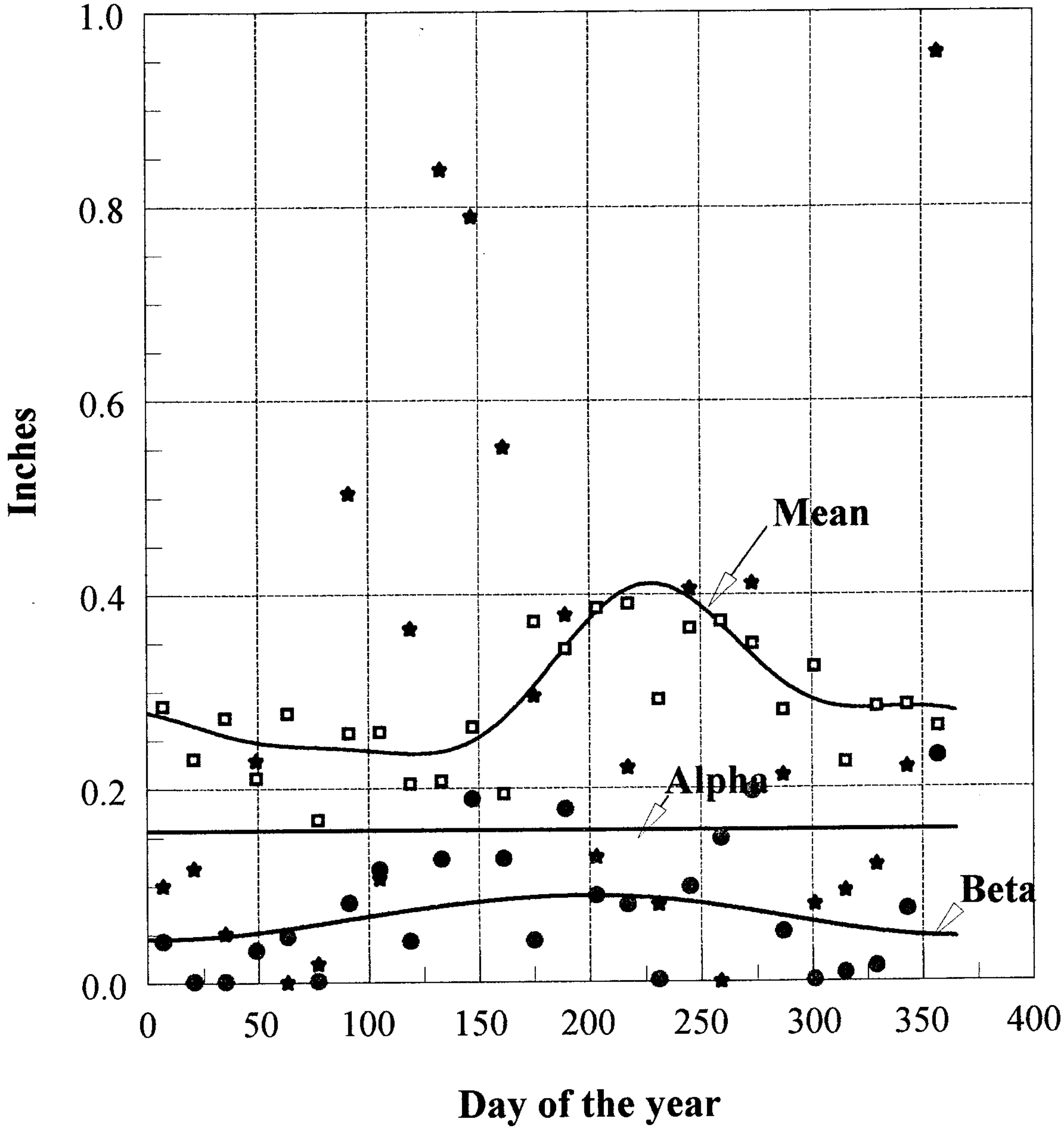
DAW 1-19-2000
ADCHPAR.



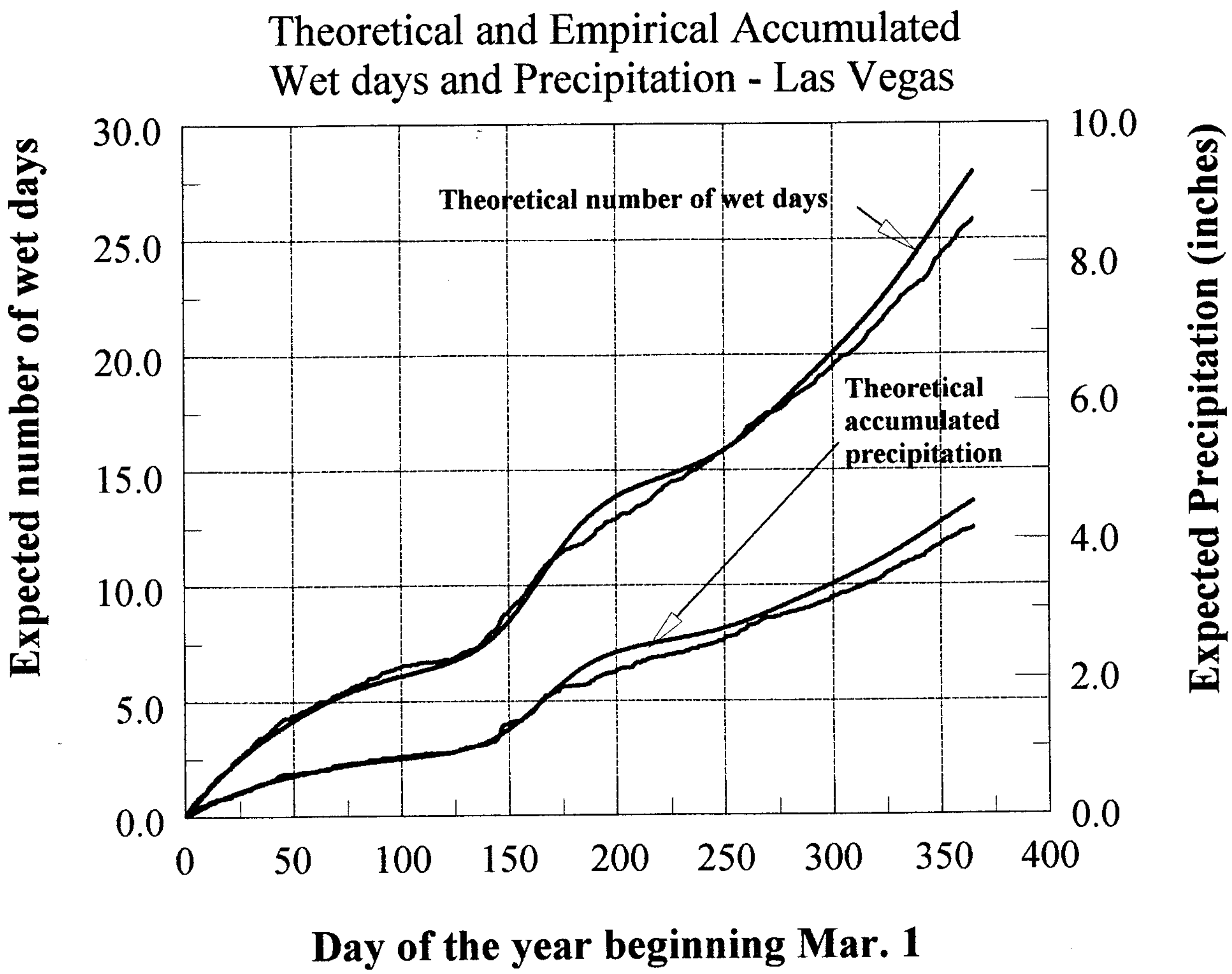
Adaven, NV

	Number of Harmonics
Markov Chain	**4**
Alpha	**0**
Beta	**2**
Mean	**3**

ADAC21PDW


1.0
0.8
0.6
0.4
0.2
0.0
Inches
Mean
Alpha
Beta
0
50
100
150
200
250
300
350
400
Day of the year

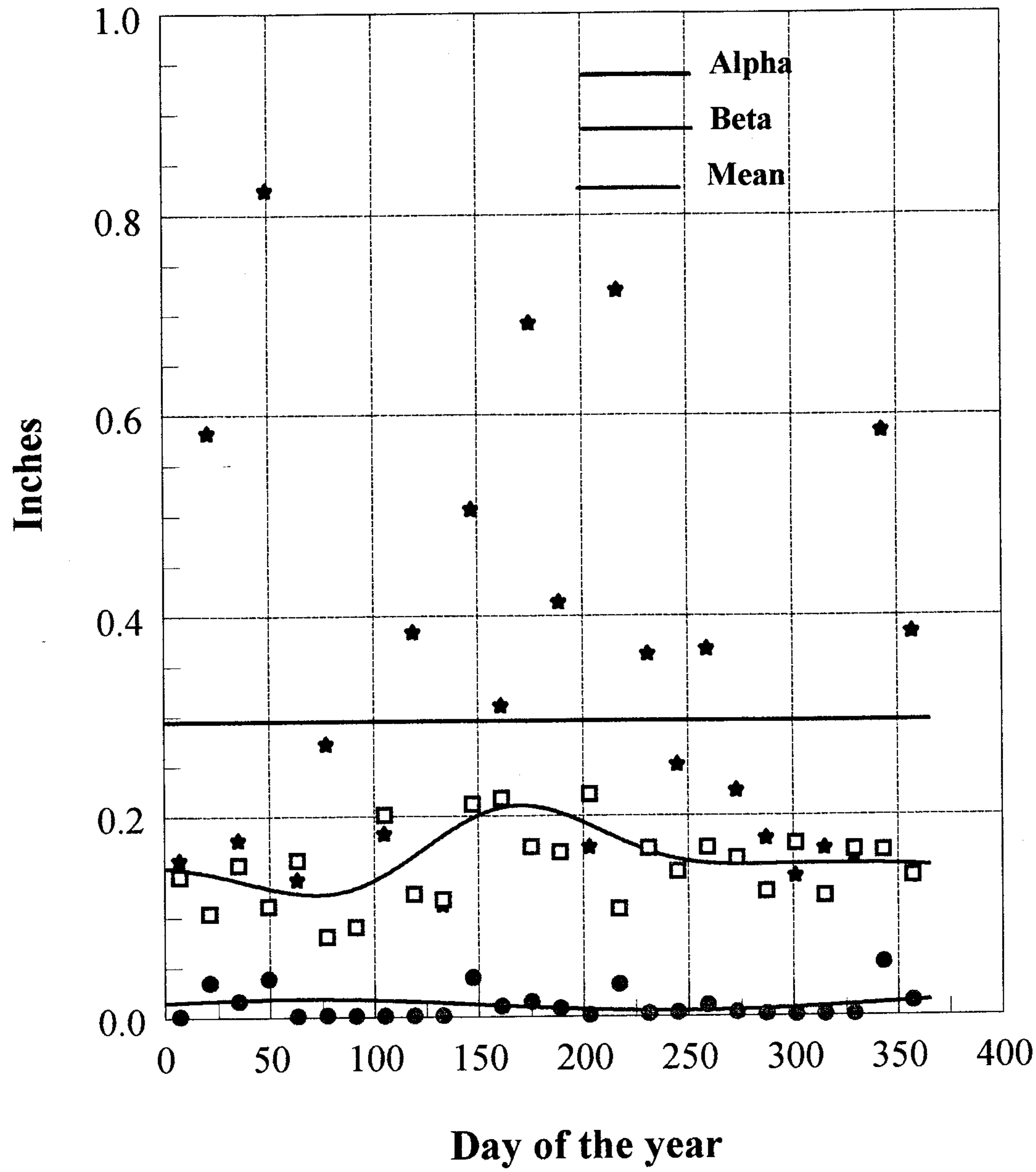
DAW



File: VEGC18.pgw
VEGC18.pdw
DAW 1-25-00

Mixed Exponentail Parameters
Las Vegas, NV

DAW



File: VEGC18PAR.pgw
VEGC18.pdw
DAW 1-25-00

==

Linear Regression Report

Data File Name: C:\consult\swri\CLIMATE\Mepar2.pdw

==

IndVar:	PMM
DepVar:	BC1

Equation: y=a*x+b

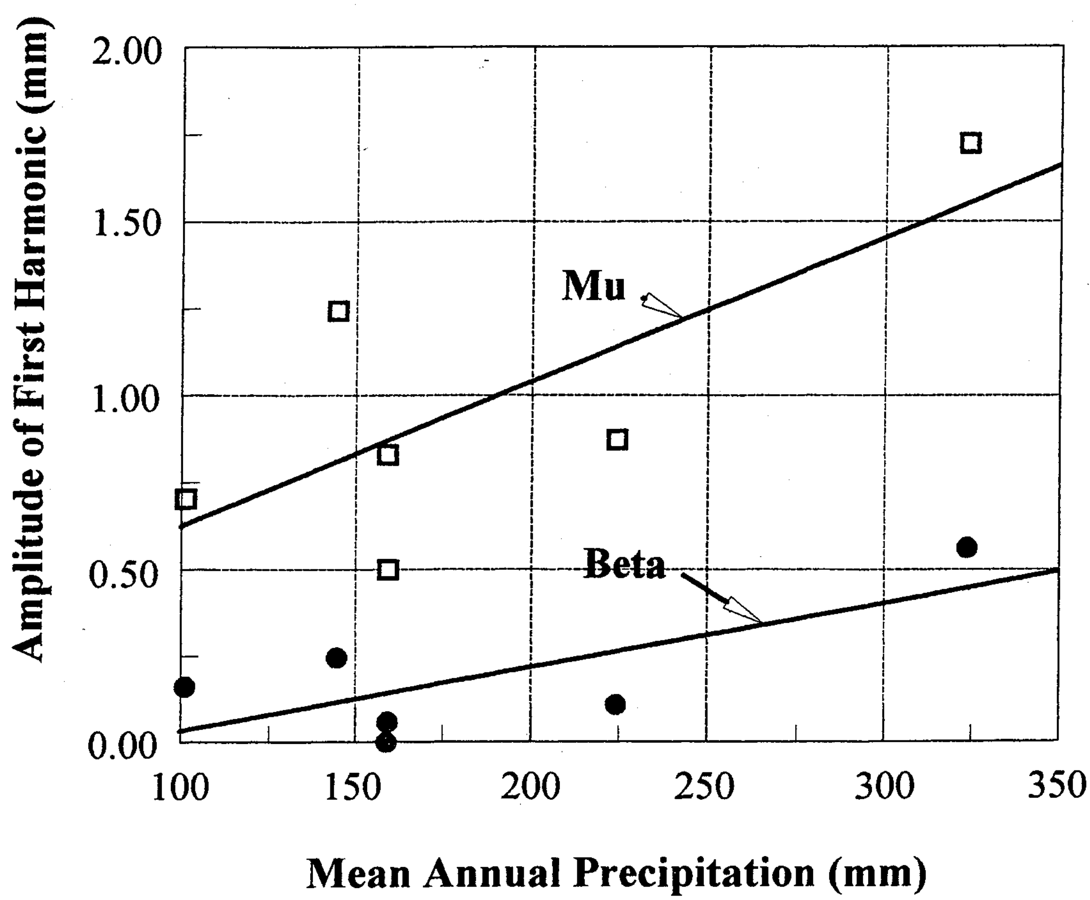
Parameter a:	0.0018447932
Parameter b:	-0.15146680
Uncertainty da:	0.00088734104
Uncertainty db:	0.17635832
Sum Sqrs:	0.097061768
StdDev:	0.13932822
R-Sq r2:	0.51936326
Correlation:	0.72066862

==

----Created by David A. Woolhiser with PSI-Plot
----Thu Jan 27 11:02:20 2000

==

DAW



File: Mepar2.pdw
MEC1B&MU.pgw

DAW 1-27-00

===

Linear Regression Report

Data File Name: C:\consult\swri\CLIMATE\Mepar2.pdw

===

IndVar:	PMM
DepVar:	MUPHI1 ϕ_{M1}

Equation: y=a*x+b

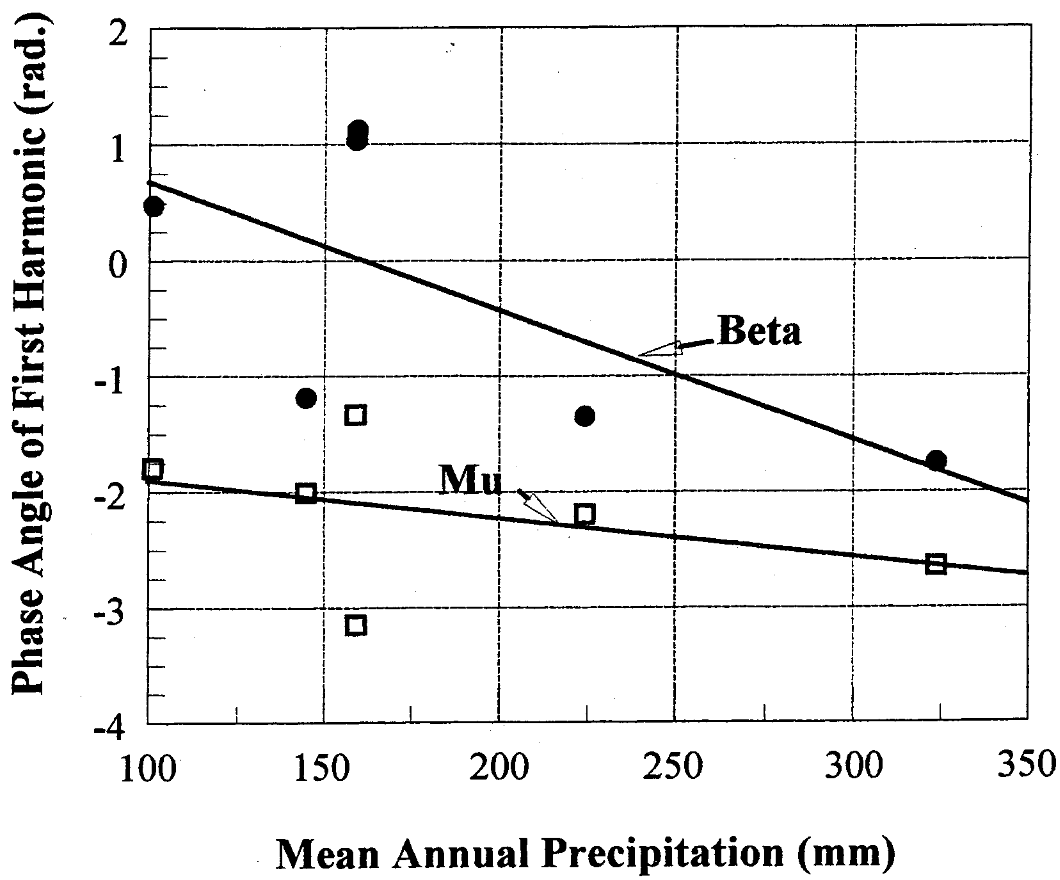
Parameter a:	-0.0033165247
Parameter b:	-1.56830706
Uncertainty da:	0.0037279367
Uncertainty db:	0.74092443
Sum Sqrs:	1.71318445
StdDev:	0.58535194
R-Sq r2:	0.16518152
Correlation:	-0.40642530

===

----Created by David A. Woolhiser with PSI-Plot
----Thu Jan 27 11:07:18 2000

===

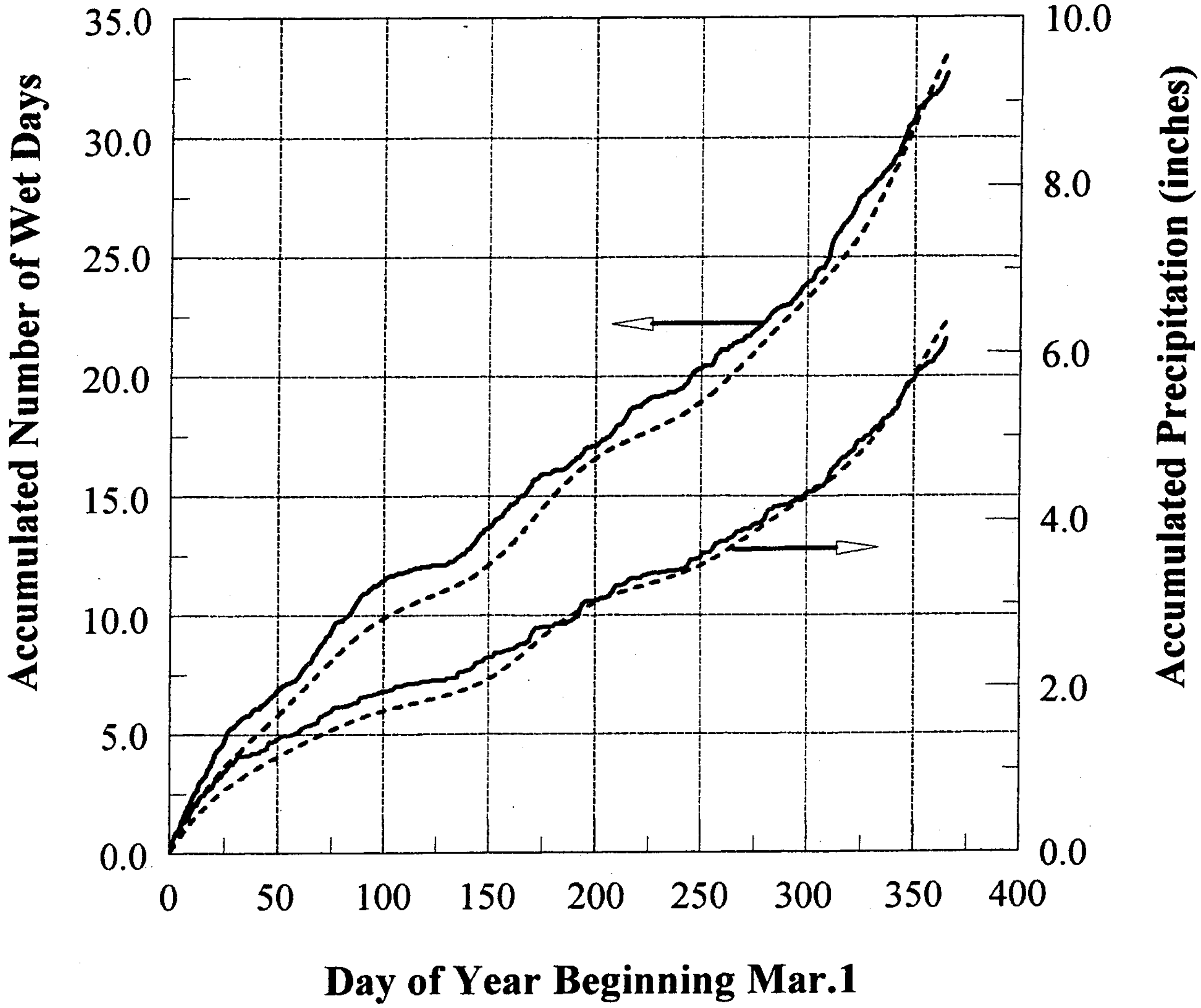
DAW



Mepar2.pdw DAW 1-27-00

MEPHI1B*MU.PGW

Theoretical and Empirical Accumulated Precipitation and Wet Days
Beatty8n Nevada



File: BEAC19ACCUM.PGW
BEAC19.O3
DAW 1-28-00

BEATTY 8N

DAW 1/28/00

24 NDD NDW NWD NWW ND NW; # OF PERIODS= 26

228	37	36	34	265	70	.8604	.514
241	33	37	22	274	59	.879	.627
298	16	16	6	314	22		
295	15	17	9	310	26		
277	24	22	13	301	35		
279	23	23	11	302	34		
290	16	17	13	306	30		
312	11	11	2	323	13	0.965	0.846
326	3	5	2	329	7	.9909	0.714
312	10	8	6	322	14		
282	22	23	9	304	32		
289	21	19	7	310	26		
299	13	16	8	312	24		
299	16	14	7	315	21		
300	16	15	5	316	20		
294	15	17	10	309	27		
317	10	9	0	327	9		
293	16	18	9	309	27		
298	16	15	7	314	22		
296	19	18	3	315	21		
294	15	16	8	309	24		
283	22	21	10	305	31		
250	30	28	28	280	56	.892	0.5
272	24	26	14	296	40		
253	31	28	22	284	50		
282	28	29	15	310	44		

only 7 wet days! ?

! only 9 wet days?