David Woolhiser

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Watershed

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Daw 5/15/01 Upper Split Wash - 100 year simulation
Continued from Scientific Notebook No. 362.

Test Runs to determine best method for disaggregating winter sequences of 3 or more days

The program COND7_3.BAS was revised from the program COND75VM.BAS used in the Solitario Canyon study. The revisions involved a change in the reading format and retaining information on sequences of wet days during the months Dec., Jan., Feb and Mar. The sequences of wet days are important during the winter months when saturation overland flow may occur on areas of the watershed with shallow soils. Because the output of COND7_3.BAS is in a different format than COND75VM.BAS, it is also necessary to revise program DAYDIS75.BAS, the program used for the Solitario Canyon study to disaggregate daily rainfall totals into individual shower depths and to assign durations to each shower depth. This program is entitled DAYDIS4.BAS. As described on p. 160 of Scientific Notebook 362, some test runs with KINEROS must be carried out to determine if the runoff and infiltration distributions are sensitive to the method used for multiple wet days and, if so, to determine the best disaggregation method.

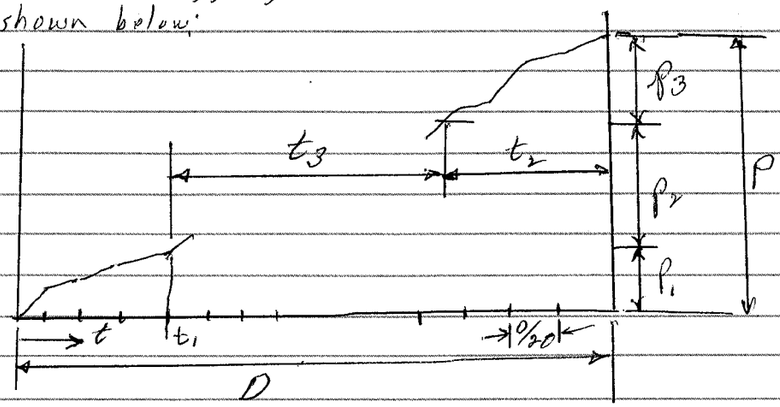
The procedures for 1-day and 2-day events with a total depth > 25.4 mm (See calculations on p 78 of Scientific Notebook 363, where the calculated depth required to saturate a soil of depth 120 mm, with porosity of 0.34, an initial relative water content of 0.375 and a maximum relative water content of 0.95, is 25.5 mm).

Method 1 Take the total depth in 3 days 725.4mm.
Use the program DAYDIS4.BAS to assign a duration: Modify program DAYDIS4.BAS so that it reads the number of days in a wet sequence. Assume that the duration is 30 hrs if the duration calculated by the program is smaller than 30 hrs. Disaggregate into 20 increments

DAW 5-16-01 Upper Split Wash - 100 yr. Simulation

Continue setting up test to determine sensitivity of the runoff-runon phenomenon to daily rainfall disaggregation methods.

Method 1: i. Take 3-day sequences with total depth > 25.4mm
ii Assume that it occurs in one continuous event
iii Return the depths for each day of the sequence define as p_1, p_2 and p_3
iv. Take the duration assigned by DAY0154.BAS and the disaggregation into 20 increments as shown below:



v. Find t_1, the time required to reach the accumulated precipitation depth p_1

vi Find t_2, the time from the end ($t = D$) to obtain the accumulated amount p_3

vii Now the amount of rain occuring on day 2 must take place in 24 hours, so the corrected duration will be: $D_c = t_1 + t_2 + 24$ (in hrs)

viii The time increments for $t_1 < t < (D - t_2)$ must be increased (or possibly decreased)

DAW 5-16-01 Sensitivity to disaggregation (Cont)

Method 3:
i. Assume p_1 occurs in 8 hrs, p_2 in 24 hrs and p_3 in 8 hrs at rates of $p_1/8(60)$, $p_2/24(60)$, $p_3/8(60)$ (mm/min) or

$p_1/8$, $p_2/24$, $p_3/8$ (mm/hr)

This is the simplest method and will be tried first.

One factor that will be crucial is the rainfall rate after the soil reaches saturation. If the rate is less than the saturated hydraulic conductivity of the bedrock, no runoff will occur.

If we consider the sequences on p 160 of scientific Notebook 362

The first sequence 10.54, 0.33, and 45.88 would result in intensities of 1.32, 0.014, and 5.73 mm/hr, for 8, 24, and 8 hrs.
SEQ1_3.PRE

The second sequence, 36.59, 1.12 and 8.90 would lead to intensities of 4.57, 0.0467, and 1.11 mm/hr
SEQ2_3.PRE

The third sequence: 3.72, 22.29 and 15.99 mm
5 0.465, 1.86 and 2.0 mm/hr.
SEQ3_3.PRE

Computer files will be in subdirectory NEWSPLIT

~~DAW 5/24/01~~
SEQ1_3B.FIL

Control file SEQ1_3.FIL
Rainfall duration = (16+24)60 = 2400 min

Δt = 2 min	Run duration = 2430 min	2500
Outflow = 3.76 mm	Rain = 56.75 mm	3.81
Channel Infiltration	0.085	0.086
stor.	.0935	0.015

q_p = 1.067 mm/hr

DAW 5-16-01 Sensitivity to disaggregation

~~SEQ3~~ ~~DAW 5/16/01~~
SEQ2_3.FIL ✓
SEQ2_3.PRE ✓
SEQ2_3.OUT

Outflow = ~~1.38 mm~~ ~~DAW 5-16-01~~ 2.35 mm
Channel F = 0.077

SEQ3_3.FIL ✓
SEQ3_3.PRE ✓
SEQ3_3.OUT ✓

Outflow = 1.38 mm
Channel F = 0.061/mm

All runs resulted in saturated overland flow. For comparisons check and compare

1) Total surface runoff
2) Distributions of excess infiltration
3) " of bedrock infiltration during storm
4) " " " " drained to field capacity
5) channel infiltration.

Should also look for relationship between soil depth and bedrock infiltration when soil is drained to field capacity, i.e. "optimum soil depth"

DAW 5/21/01 Sensitivity to disaggregation scheme (con't)

Set up precipitation files for Method 1, described on p 1.

Files are in subdirectory NewSplit.

For the first sequence, 10.54, 0.33 and 45.88 (Total 56.75 mm) create a test file for input to DAYDIS4.BAS. Input is of form:

Mon. Day, Year, Depth (mm), 7-Day API, No. of days in sequence

For this sequence and the other two, the input data will be:

JAN	15	42	56.75	1.31	6	(3 out of 6)
MAR	22	24	46.61	1.88	5	(3 out of 5)
DEC	28	18	42.0	10.96	3	

File is named SEQTEST.CON ✓
Run completed with DAYDIS4.BAS. All events were assigned a duration of 30 hrs. (1800 min)

Now disaggregate storms into 20 time increments. Use program RAINSIM6.BAS (A modification of RAINSIM5.BAS used in Solitario Canyon study. Modified to accomodate a different input format) Input is of the form:

MON, DAY, YEAR, No. of events, Depth, 7-day API, wet days in seq.

Disaggregation completed. Files on Disk A. are PJAN221.PRE, PMAR222.PRE and PDEC223.PRE (Note: will need to revise precip file naming convention)

Now set up control files for KINEROS

Daw 5/21/01 Sensitivity to disaggregation cont

	SEQ1_1.FIL	SEQ2_1.FIL	SEQ3_1.FIL
	A:PJAN721.PRE	A:PMAR722.PRE	A:PDEC723.PRE
	SEQ1_1.OUT	SEQ2_1.OUT	SEQ3_1.OUT
Outflow	4.15 mm	2.015	1.18

Length of run was set to 1900 min for each case

Δt = 2 min

Chan. F	0.119 mm	0.098	0.082
STOR	0.012 mm	0.005	0.0007
Q_{peak}	0.388 mm/hr		

Daw 5/23/01

Set up precipitation files for Method 2, described on p. 2. Because we are attempting to retain the daily amounts, select storm patterns that reflect the daily sequences as closely as possible. This means that t_g will be approximately 24 hrs.

Created 3 files with RAINSIM6.BAS using SEQTEST.DUR as input.

JAN15_42.PRE MAR22_24.PRE DEC28_18.PRE

Randomly generated storm patterns which resembled the daily patterns of the sequences were obtained.

Daw 5/24/01

Edit above files - change times so that $t_g \approx 24$ hrs

	J15_42ED.PRE	M22_24ED.PRE	D28_18ED.PRE
	SEQ1_2.FIL	SEQ2_2.FIL	SEQ3_2.FIL
DURATION	3340 min	3340	2170
OUTFLOW	3.92 mm, I_p=0.978 mm/hr	2.105	1.80
STOR	0.015 mm	0.006	0.012
Chan F	0.165	0.120	0.063
RANGE	3.76-4.15 mm	2.015-2.35 mm	1.18-1.80 mm
	Δ = 0.39	0.34	0.62
Chan F Range	.085-.165	.077-0.120	.041-0.087

Daw 5/24/01 Sensitivity to disaggregation (Con't)

There is very little difference in runoff volumes from the entire Upper Split Wash watershed, reflecting that the saturation overland flow process is threshold related, i.e. so long as each disaggregation procedure retains the total rainfall, runoff will be very similar. Of course, the hydrographs will be quite different since they will reflect the rainfall intensity pattern.

Variations in channel infiltration are rather small in an absolute sense but quite large in terms of percentage. Much of this may be due to the computed durations assigned for Method 3. A new run was made, control file SEQ1_3B.FIL where duration was increased from 2430 mm to 2500 min. Results are shown on p. 3 Runoff increased, channel infiltration increased, but only by 0.01 mm. Storage decreased from 0.0938 mm to 0.015 mm as expected.

Now check CDF's of plane & channel elements for each sequence. Use program CDF2.BAS

	ROCK INFIL	ROCK INFIL	SAT AREA
SEQ1_1.OUT	5.65	10.23	0.552
SEQ1_2.OUT	5.99	10.80	0.555
SEQ1_3.OUT	7.29	13.69	0.532
SEQ2_1	3.67	7.40	0.496
SEQ2_2	3.62	7.23	0.500
SEQ2_3	3.34	6.73	0.496
SEQ3_1	2.28	5.12	0.446
SEQ3_2	1.52	3.42	0.446
SEQ3_3	2.08	4.79	0.434

DAW 5/24/01

CDF2.BAS creates 2 output files

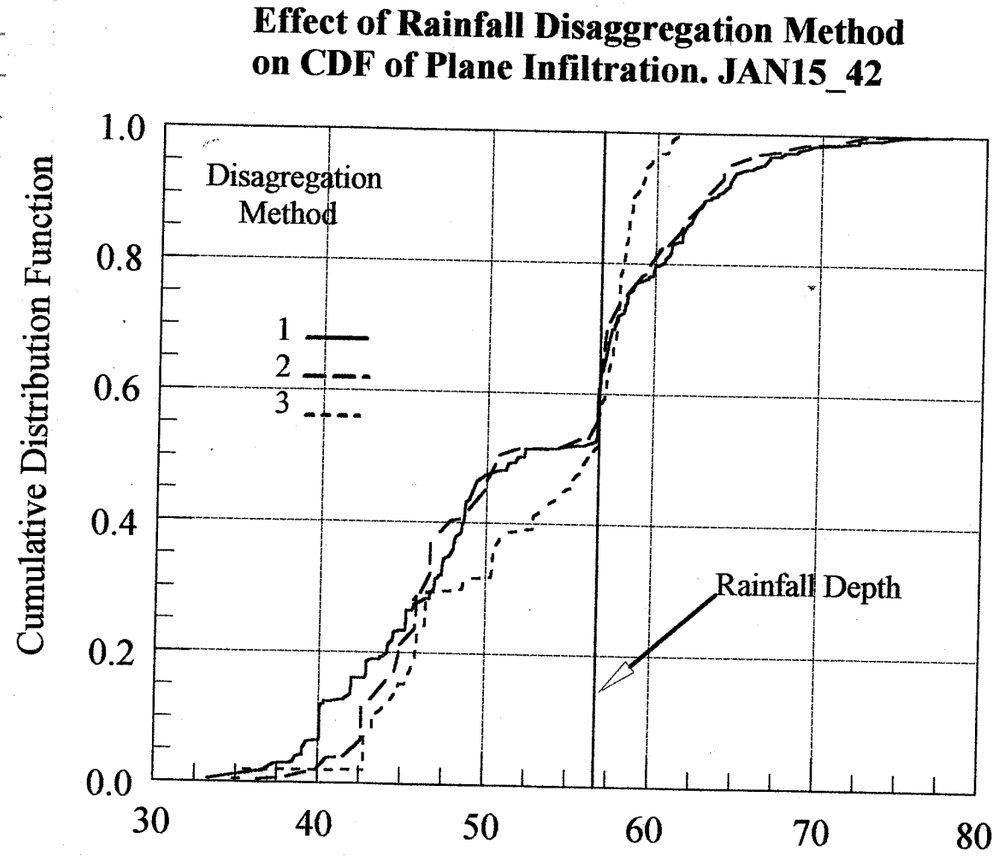
1) <INPUT FILE NAME>.CDF
Columns are:
Element No. Total Plane F(mm) CDF(Plane) Rock el.# Rock F CDF

2) <INPUT FILE NAME>.CHN
channel infiltration in m^3
in order of channels

Used PsiPlot to create a figure showing CDFs of plane infiltration for each method for the event JAN15_42, Sequence #1. See figure on p. 9.

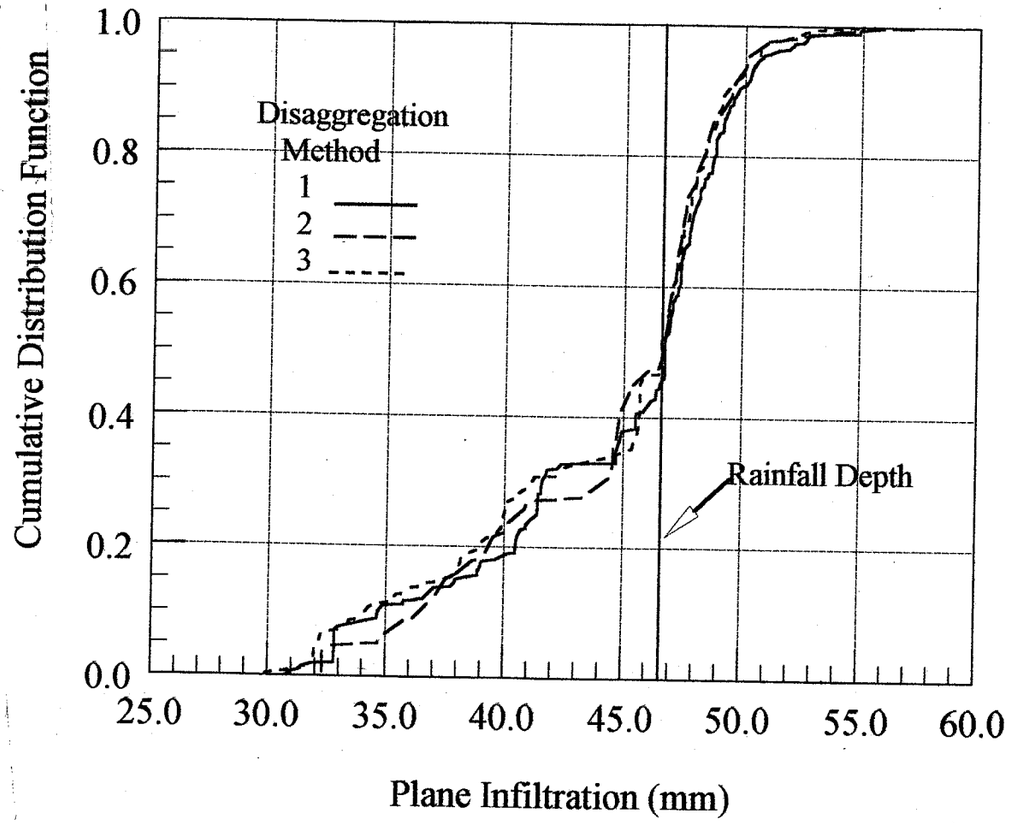
DAW 5/25/01
Used PsiPlot to create figures showing CDFs for each method for the events MAR22-24 and DEC28_18 (Sequences 2 and 3) See figures on p 10 and 11.

The CDFs of plane infiltration are very similar for methods ~~2 and 3~~ DAW 5/25 1 and 2 for sequence 1. The CDF for method 3 shows less runoff and less runon for plane elements. This can be explained by reviewing the rainfall intensity patterns shown on p. 12. Because most of the rainfall for this sequence occured on days 1 and 3 and method 3 assumes that the rainfall on those days occurs in 8 hours the pattern for method 3 consists of 2 8hr pulses separated by 24 hours with a very low intensity. This means that the duration of runoff will be shorter (see hydrographs on p 12). Analysis of the runoff-runon phenomena (see p 156, Scientific Notebook 362)



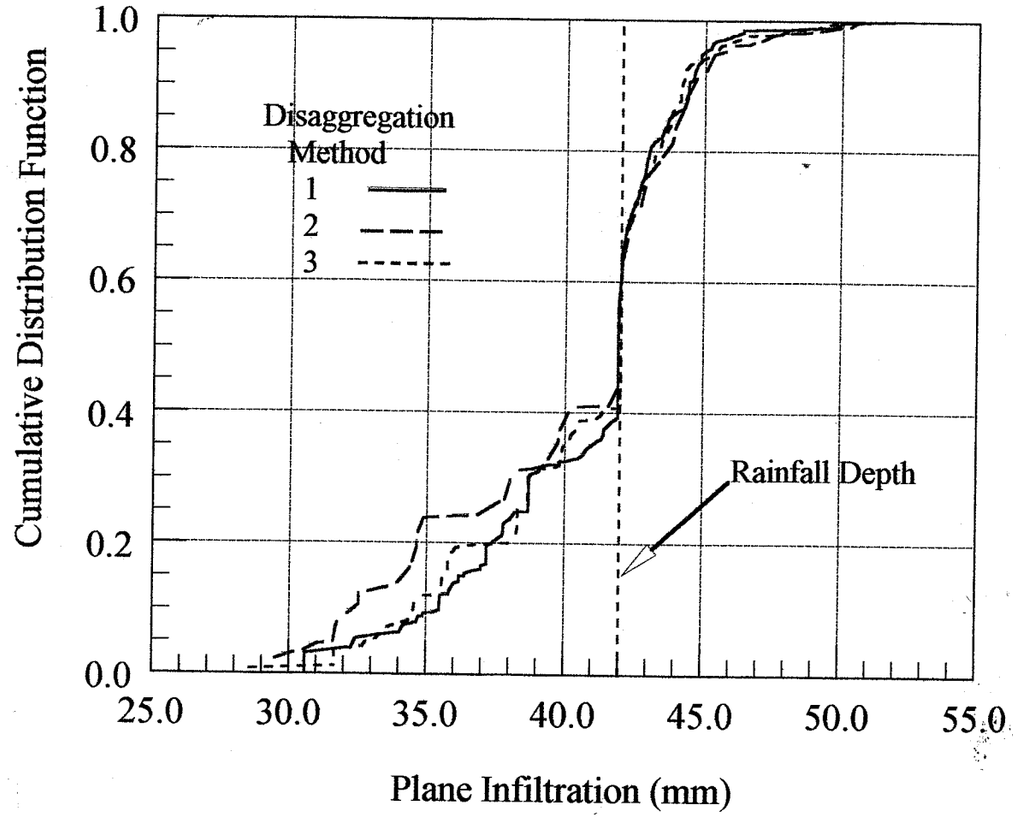
File: SEQ1.PGW
daw 5/24/01

shows that the quantity of runon (infiltration excess) increases with duration of runoff. The hydrographs shown on page 12 reveal that the runoff duration for method 3 is much shorter than for methods 1 and 2. Because the disaggregation methods differ, the rainfall (and runoff) patterns are different.



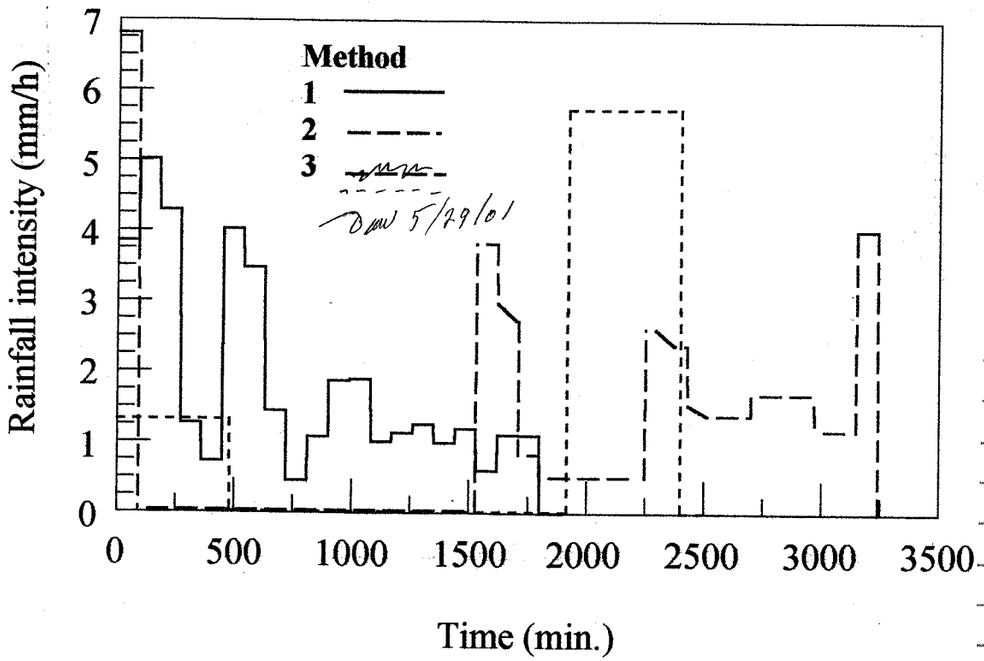
Daw 5/29/01.

The CDFs of plane infiltration for sequence 2 are very similar. A review of the rainfall patterns and runoff hydrographs on p 13, shows that although the temporal patterns are different for each method the runoff durations are similar, explaining the similar CDFs.

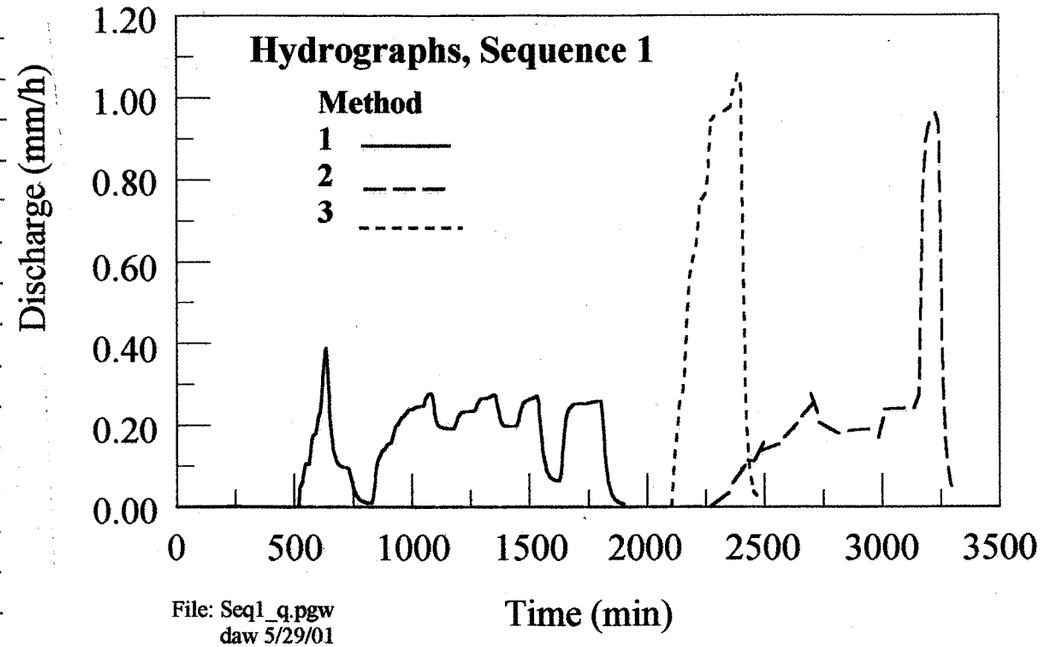


Daw 5/29/01 The CDFs for sequence 3 (the smallest storm) shows that about 25% of the area had neither runoff or runon. The runon portion of the CDFs are very similar. Method 2 shows a greater amount of runoff from some planes elements resulting in slightly greater runon quantities. daw 5/29/01
The rainfall patterns and hydrographs are shown on p14.

Rainfall Intensity Patterns, Sequence 1

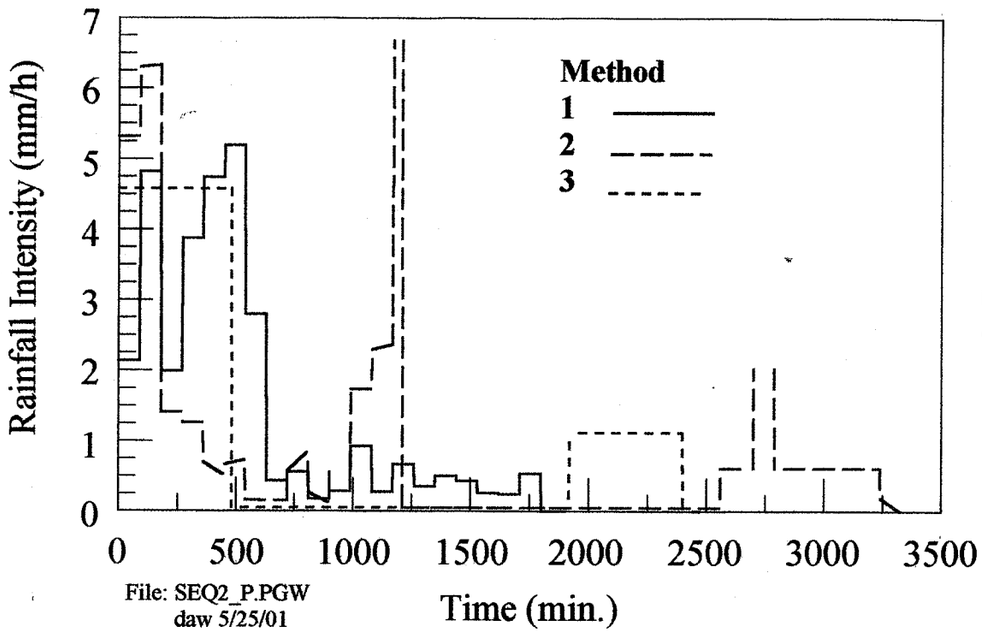


File: SEQ1_P.PGW
daw 5/25/01

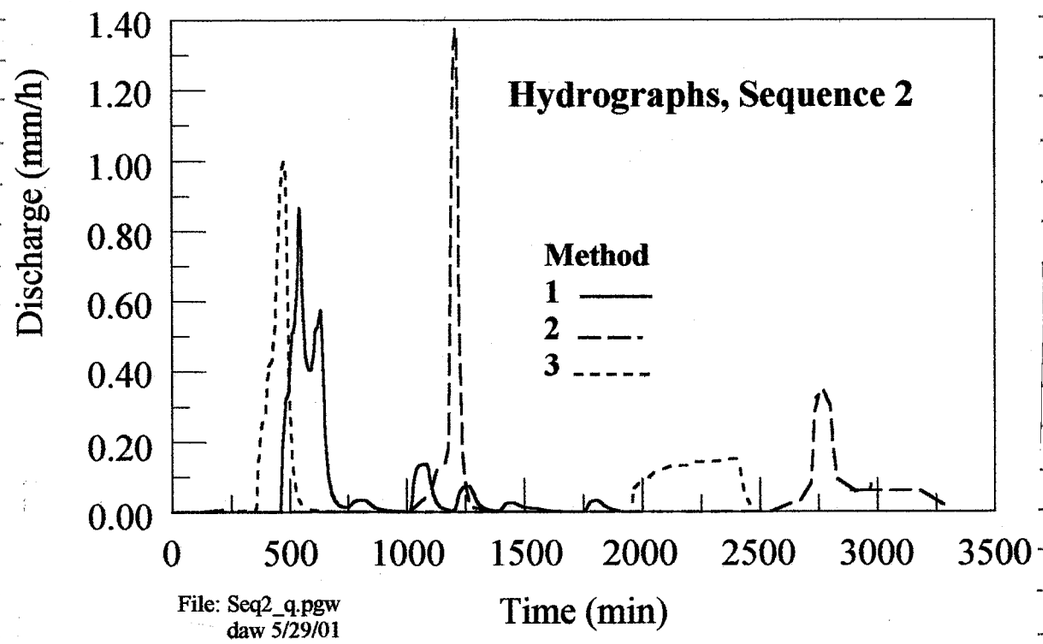


File: Seq1_q.pgw
daw 5/29/01

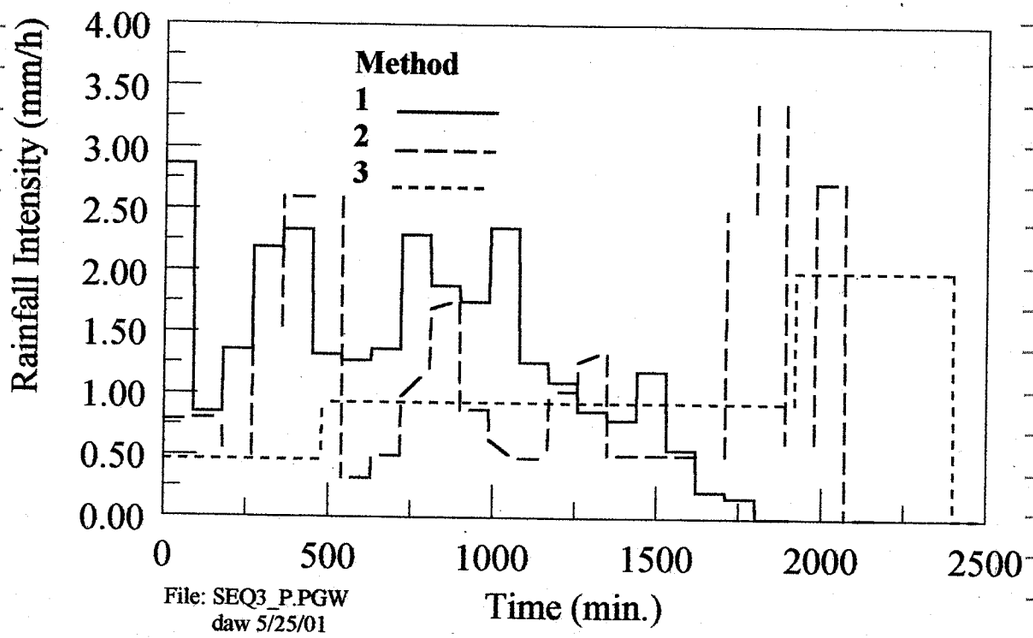
Rainfall Intensity Patterns, Sequence 2

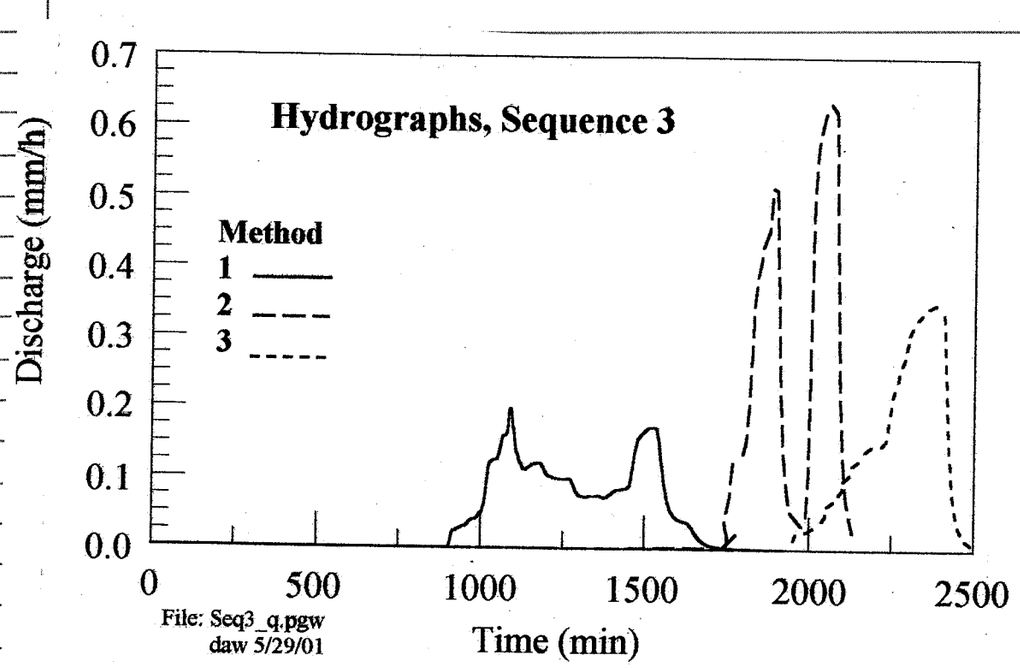


File: SEQ2_P.PGW
daw 5/25/01



File: Seq2_q.pgw
daw 5/29/01





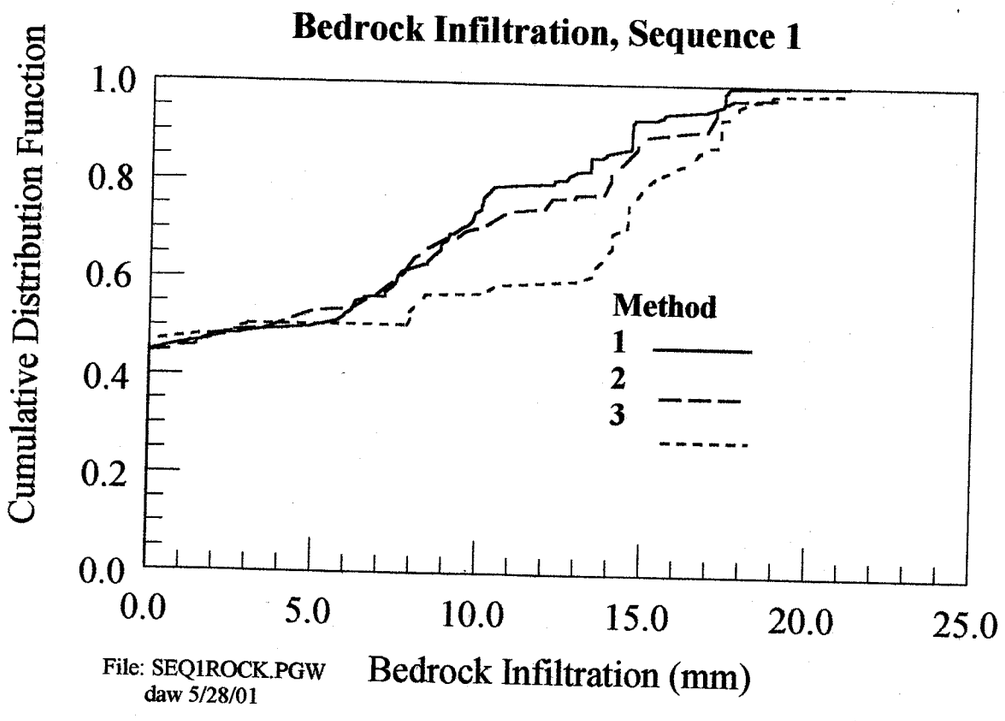
Daw 5/30/01 Effects of Winter Rainfall Disaggregation method on Bedrock Infiltration During the storm

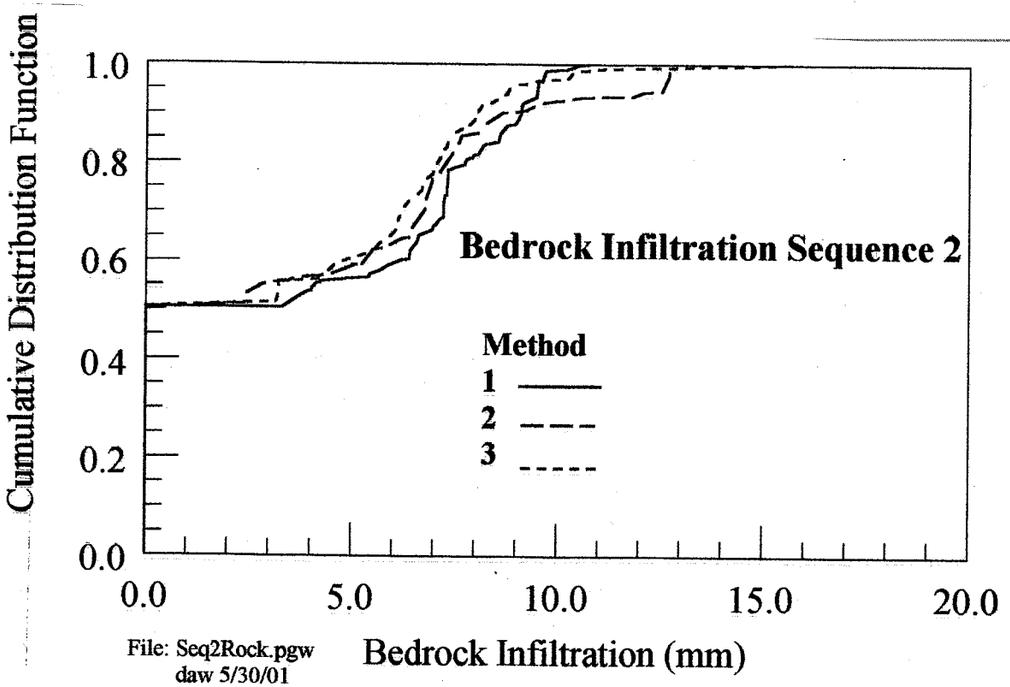
Infiltration into bedrock during a storm is dependent on the duration of soil saturation. The CDFs of bedrock infiltration during a storm are shown on pages 16 and 17. The percentage of the watershed area saturated during the storm is indicated by the CDF value at zero infiltration the saturated portion is $1-F(0)$. For all sequences the three methods give approximately the same values. For sequence 1, method 1 and 2 result in very similar CDFs while method 3 leads to a greater mean infiltration depth. The CDFs are very similar for sequence 2 while for sequence 3, method 2 results in a lower mean rate.

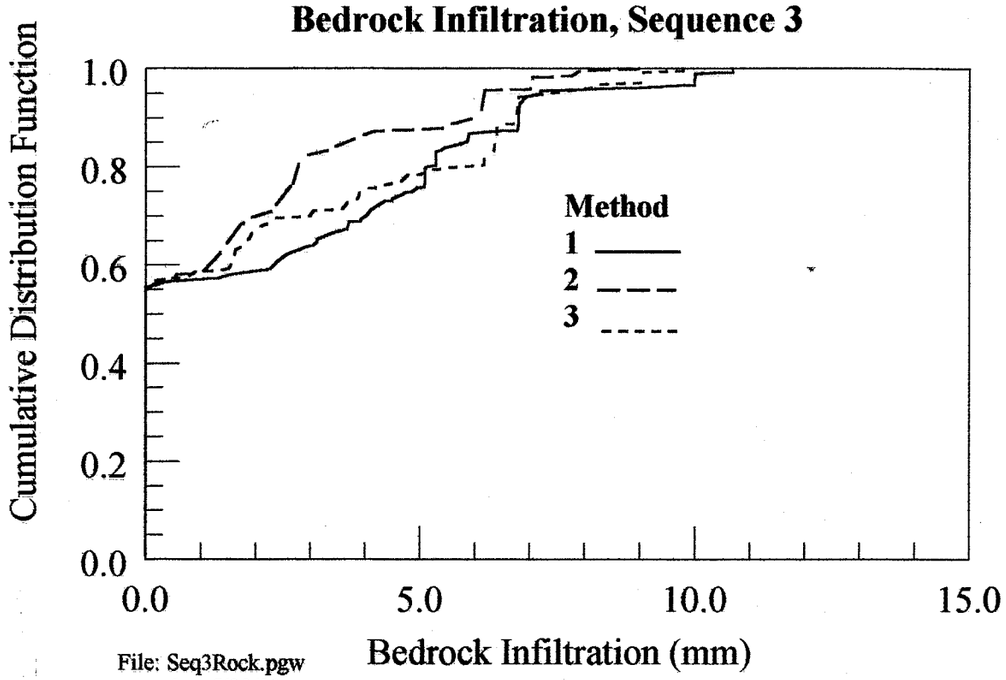
Daw 5/31/01 Effects of Winter Rainfall Disaggregation methods on channel infiltration into bedrock after drainage of the channel alluvium to field capacity

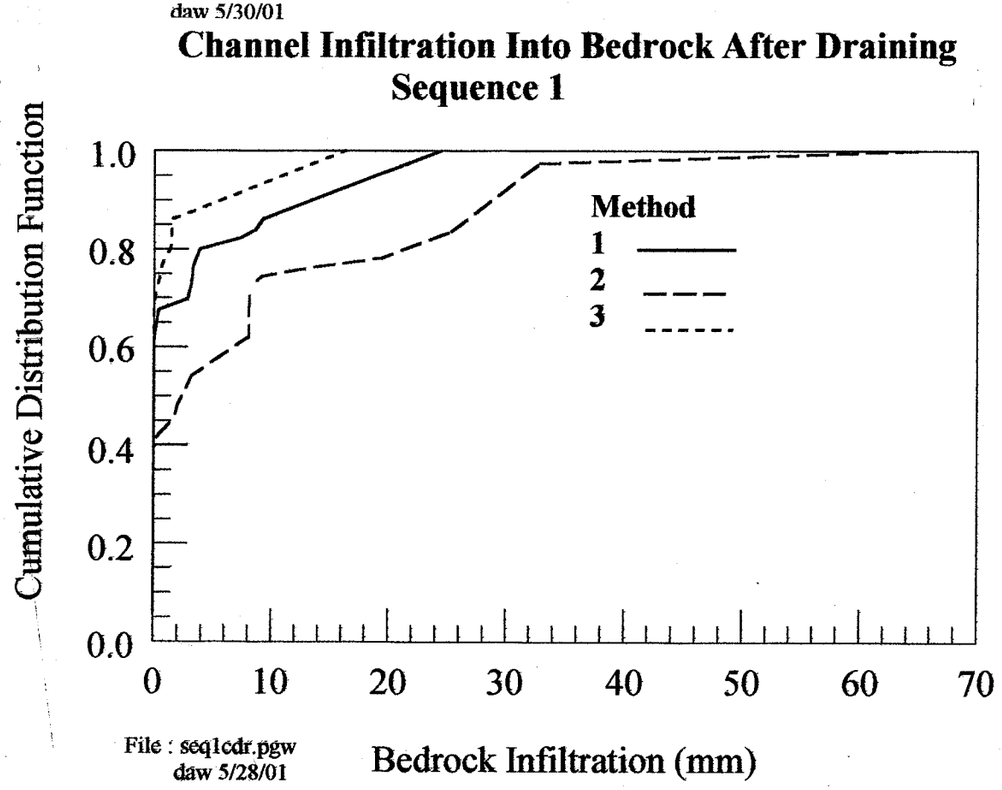
The procedures used to calculate "potential Bedrock Infiltration" are described in pages 116–121 of scientific Notebook 362. The program used is CHANCDF.BAS and the output is in files SEQ1_1.CDC, SEQ1_2.CDC, SEQ1_3.CDC, SEQ2_1.CDC, etc. where _1, _2, _3 refers to the rainfall disaggregation method.

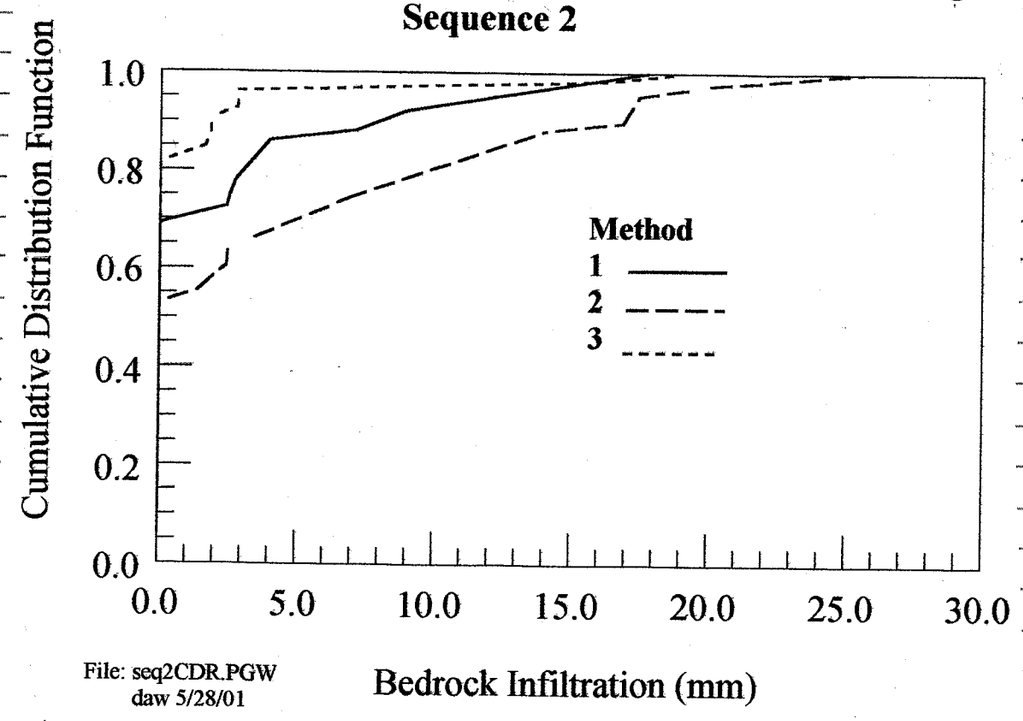
CDFs for channel infiltration after drainage (potential bedrock infiltration) are shown on pages 17 and 18. Method 2 results in a higher percentage of saturation and greater mean infiltration for rainfall sequences 1 and 2. There wasn't a great deal of channel bedrock infiltration for sequence 3. To be conservative, it appears that method 2 is superior for this aspect of redistribution. One factor to be considered is snow. Temperatures during the winter suggest that some of the multi-day events are snow.


Bedrock Infiltration, Sequence 1
Cumulative Distribution Function
1.0
0.8
0.6
0.4
0.2
0.0
0.0
5.0
10.0
15.0
20.0
25.0
Method
1
2
3
Bedrock Infiltration (mm)
File: SEQ1ROCK.PGW
daw 5/28/01

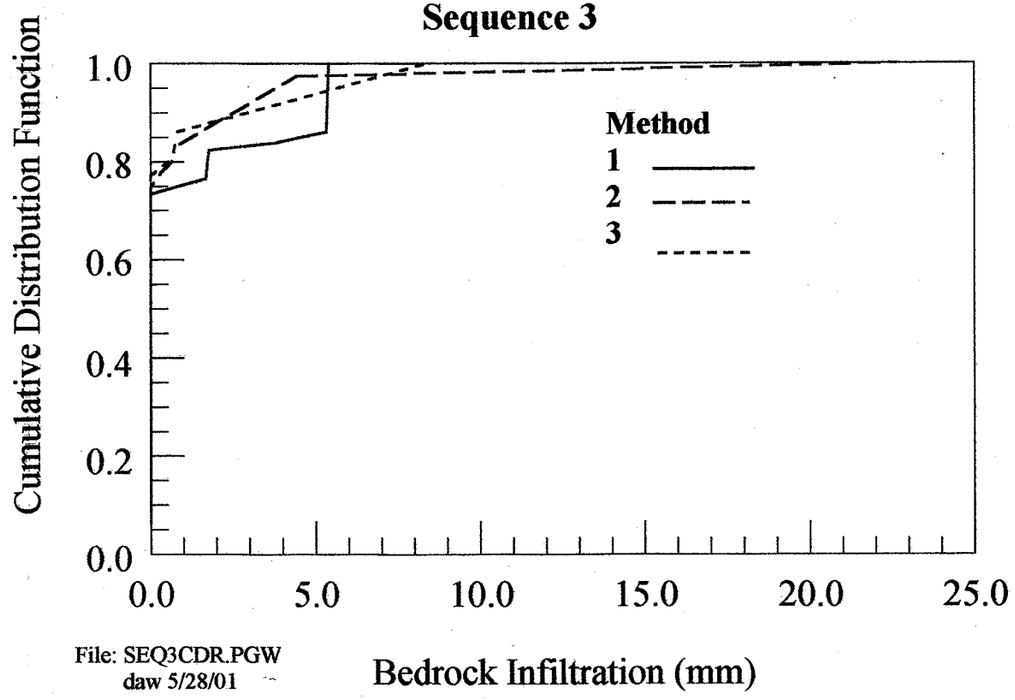

Bedrock Infiltration Sequence 2
Cumulative Distribution Function
1.0
0.8
0.6
0.4
0.2
0.0
0.0
5.0
10.0
15.0
20.0
Method
1
2
3
Bedrock Infiltration (mm)
File: Seq2Rock.pgw
daw 5/30/01


Bedrock Infiltration, Sequence 3
Cumulative Distribution Function
1.0
0.8
0.6
0.4
0.2
0.0
0.0
5.0
10.0
15.0
Method
1
2
3
Bedrock Infiltration (mm)
File: Seq3Rock.pgw
daw 5/30/01


Channel Infiltration Into Bedrock After Draining
Sequence 1
Cumulative Distribution Function
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
Method
1
2
3
Bedrock Infiltration (mm)
File : seq1cdr.pgw
daw 5/28/01



File: seq2CDR.PGW
daw 5/28/01



File: SEQ3CDR.PGW
daw 5/28/01

Daw 6/4/01 Set up Procedures and File-Naming Protocal for Production Runs. 100-yr. simulation Upper Split Wash - Present Day Climate.

Because of differences in disaggregation of multi-day precipitation sequences, precipitation files for KINEROS will be placed in 4 sub-directories

subdirectory: NEWSPLIT - will contain parameter files

- YUCP_A_S (precipitation, First 50 yr. simulation, summer)
- YUCP_A_W (winter)
- YUCP_B_S (2nd 50 yr. simulation)
- YUCP_B_W

Note: I found that KINEROS2 (Under DOS) couldn't read a precip file so far down the directory tree. These directories will be moved to a position at the same level as NEWSPLIT
Daw 6/11/01

The summer rainfall files (all with depth > 12.7mm) will first be used as input to a single plane element to see if Hortonian runoff will be generated. The plane element used is Plane 170. Test parameter files are in NEWSPLIT. They are:

TESTJ_A.PAR	January - April
TESTJ_O.PAR	July - Oct
TEST_N.PAR	November
TEST_O.PAR	December
TESTM_J.PAR	MAY + June

Daw 6/11/01 Summer Season, First 50yr Simulation (Con't.)

First, I must establish a runoff threshold for the test plane element that will be significant for the entire watershed. Output from the plane runs (only summary water balance information will be in subdirectory PLANETSTA Daw 6/11/01

A log of the runs will be kept on the sheet on p. 22 Daw 6/12/01 and 23 and 24.

Run numbers will be of the form SW_P1, SW_P2 etc. SW refers to split wash, P to plane runs.

Daw 6/12/01

All precipitation files for summer for 1st 50 yr sequence are complete. Files are in directory YUCP_A_S and on floppy disk for easy input to Laineres.
Seven computer runs completed for the plane element.
A total of 50 events for the months Apr.–Nov.

Method to handle winter sequences (Dec–Mar)

File YUCAWIN.CON is examined to identify sequences of wet days of 3 or more.

A new file YUCAWIN2.CON is created by manual editing, entering the 3 day totals for sequences of 3 or more wet days.

A new file YUCAWIN3.CON is created by manual editing. The 3-day precipitation amounts are entered on the same line. This file will be printed out and used to select appropriate rain fall patterns

Daw 6/11/01

when the storm disaggregation program, RAINSIM6.BAS Daw 6/12/01 is run with YUCAWIN2.DUR as input. The date of the storm is printed before the graphical display of the accumulated dimensionless rainfall pattern. The operator can check the 3-day precipitation pattern for that date and reject stochastic patterns until one approximates that sequence.

Daw 6/13/01

Edit winter files for 50 yr simulation A, (YUCSIMA.PTR)
Create YUCAWIN2.CON & YUCAWIN3.CON
Print out YUCAWIN3.CON

RUNDAYDIS4.BAS with YUCAWIN2.CON as Input
Output is YUCAWIN2.DUR

RUN RAINSIM6.BAS OUTPUT goes to YUCP_A_W

This resulted in 39 events.

After reviewing the intensities, it appears that they are too high for 2-day events during the winter. The assumption that the rain occurs as a single event over midnight leads to this result. For 2-day events it seems reasonable to multiply the duration for a summer storm by (number of days * 4.21) DAYDIS4.BAS ~~RAINSIM6.BAS~~ Daw 6/13/01 modified to account for this.

Now copy YUCAWIN2.CON to YUCWTST.CON
and run RAINSIM6.BAS ✓

Get 39 events > 25.4 mm in Dec, Jan, Feb, Mar.
Thus a total of 89 events in 50 yrs 1.78/yr. Compare with 17 in 9 yrs for SAIC data.

DAW 6/15/01 Tables of Computer Runs for Single Plane Element

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_1
YUCSIMA simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_P1 ✓	KIN00_7 6/13/01	MAY30_01	TESTM_J	SW_P1		0	
SW_P2 ✓	KIN00_7 6/12/01	JUL09_02	TESTJ_0	SW_P2		2.70	
SW_P3 ✓	KIN00_7 "	NOV07_04	TEST_N	SW_P3		<0.01	
SW_P4 ✓	"	JUN28_05	TESTM_J	SW_P4		7.15	
SW_P5 ✓	6/12/01	NOV04_05	TEST_N	SW_P5		<0.01	
SW_P6 ✓	" 6/13/01	JUN02_06	TESTM_J	SW_P6		1.37 6/14/01	
SW_P7 ✓	" 6/12/01	SEP18_06	TESTJ_0	SW_P7		1.37	
SW_P8 ✓	"	OCT07_06	"	SW_P8		0.19	
SW_P9 ✓	"	JUL27_09	"	SW_P9		<0.01	
SW_P10 ✓	6/12/01	NOV13_09	TEST_N	SW_P10		0	
SW_P11 ✓	6/13/01	APR14_10	TESTJ_A	SW_P11		0.15	
SW_P12 ✓	6/13/01	APR21_10	"	SW_P12		0	
SW_P13 ✓	6/13/01	OCT04_11	TESTJ_0	SW_P13		0.016	
SW_P14 ✓	6/13/01	OCT05_11	"	SW_P14		9.24	
SW_P15	6/14/01	APR16_12	TESTJ_A			0	
SW_P16	6/15/01	AUG08_15	TESTJ_0			2.31	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_P17 ✓	6/15/01	OCT20_15	TESTJ_0			0	
SW_P18 ✓	"	MAY29_17	TESTM_J			9.37	
SW_P19 ✓	"	SEP20_17	TESTJ_0			7.43	
SW_P20 ✓	"	APR29_18	TESTJ_A			1.30	
SW_P21 ✓	"	JUL12_18	TESTJ_0			6.29	
SW_P22 ✓	"	JUL13_18	TESTJ_0			4.63	
SW_P23 ✓	"	JUL24_18	TESTJ_0			11.27	
SW_P24 ✓	"	JUN22_19	TESTM_J			7.86	
SW_P25 ✓	KIN00_7	APR02_23	TESTJ_A			0	
SW_P26 ✓	KIN00_7	JUL30_24	TESTJ_0			.93	
SW_P27 ✓	KIN00_7	AUG19_24	TESTJ_0			3.91	
SW_P28 ✓	6/15	JUL20_25	TESTJ_0			5.43	
SW_P29 ✓		JUL21_25	TESTJ_0			11.26	
SW_P30 ✓		OCT06_25	TESTJ_0			<.01	
SW_P31 ✓		JUL22_26	TESTJ_0			.65	
SW_P32 ✓	6/15	NOV05_26	TEST_N			1.13	

Note: All runs with program KIN00_7

DAW Tables of Computer Runs (Cont) 6/15/01

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_1
YUCSIMA simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_P33 ✓	~~APR28_27~~ 6/15	APR28_27	TESTJ_A			0	
SW_P34 ✓	~~JUN26~~	JUN26_30	TESTM_J			3.74	
SW_P35 ✓		JUN28_30	TESTM_J			.77	
SW_P36 ✓		JUL20_31	TESTJ_0			3.38	
SW_P37 ✓		JUL01_32	TESTJ_0			6.52	
SW_P38 ✓		AUG14_34	TESTJ_0			1.48	
SW_P39 ✓		MAY18_33	TESTM_J			2.73	
SW_P40 ✓		NOV15_35	TEST_N			0	
SW_P41 ✓		MAY08_37	TESTM_J			2.97	
SW_P42 ✓		JUN24_41	TESTM_J			.03	
SW_P43 ✓		AUG01_42	TESTJ_0			.82	
SW_P44 ✓		OCT16_46	TESTJ_0			<.01	
SW_P45 ✓		NOV24_46	TEST_N			3.58	
SW_P46 ✓		JUN04_47	TESTM_J			0	
SW_P47 ✓		AUG09_47	TESTJ_0			1.81	
SW_P48 ✓	6/15	JUL04_49	TESTJ_0			.02	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
✓ SW_P49	6/15	JUL23_50	TESTJ_0			8.38	
✓ SW_P50		SEP13_50	TESTJ_0			11.93	
✓ SW_P51		DEC19_03	TEST_D	SW_P51		23.02	
✓ SW_P52		FEB26_03	TESTJ_A			28.17	
✓ SW_P53		FEB27_04	TESTJ_A			.57	
✓ SW_P54		DEC10_07	TEST_D			7.35	
✓ SW_P55		JAN26_07	TESTJ_A			<.01	
✓ SW_P56		DEC25_09	TEST_D			18.26	
✓ SW_P57		JAN18_13	TESTJ_A			.15	
✓ SW_P58		MAR26_14	TESTJ_A			5.99	
✓ SW_P59		DEC11_14	TEST_D			8.31	
✓ SW_P60		JAN21_14	TESTJ_A			13.59	
✓ SW_P61		JAN18_15	TESTJ_A			3.42	
✓ SW_P62		JAN06_16	TESTJ_A			.47	
✓ SW_P63		FEB03_16	TESTJ_A			3.17	
✓ SW_P64	6/15	DEC28_18	TEST_D			2.90	

← Begin winter runs

Daw 6/15/01 Tables of Computer Runs for Single plane Element (Con't)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_1
YUCSIMA simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
✓ SW_P65	KINOV_7 6/15/01	JAN05_18	TEST_A			.06	
✓ SW_P66		DEC12_21	TEST_D			0	
✓ SW_P67		JAN18_23	TEST_A			13.8	
✓ SW_P68		MAR13_25	TEST_A			17.07	
✓ SW_P69		DEC20_25	TEST_D			1.21	
✓ SW_P70		FEB26_25	TEST_A			11.94	
✓ SW_P71		JAN01_26	TEST_A			1.08	
✓ SW_P72		FEB08_28	TEST_A			2.49	
✓ SW_P73		JAN06_29	TEST_A			.34	
✓ SW_P74		DEC25_33	TEST_D			15.98	
✓ SW_P75		JAN13_33	TEST_A			.22	
✓ SW_P76		JAN14_34	TEST_A			3.94	
✓ SW_P77		FEB24_35	TEST_A			.32	
✓ SW_P78		DEC01_40	TEST_D			<0.01	
✓ SW_P79		DEC08_40	TEST_D			0.76	
✓ SW_P80	6/15/01	JAN24_40	TEST_A			.21	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
✓ SW_P81	KINOV_7 6/15/01	JAN29_40	TEST_A			<.01	
✓ SW_P82		MAR09_41	TEST_A			7.92	
✓ SW_P83		FEB27_41	TEST_A			37.44	
✓ SW_P84		JAN14_42	TEST_A			21.59	
✓ SW_P85		DEC28_46	TEST_D			3.50	
✓ SW_P86		JAN17_46	TEST_A			2.29	
✓ SW_P87		MAR06_49	TEST_A			1.64	
✓ SW_P88		FEB19_49	TEST_A			.07	
✓ SW_P89	6/15/01	JAN12_50	TEST_A			.02	
SW_P90							
SW_P91							
SW_P92							
SW_P93							
SW_P94							
SW_P95							
SW_P96							

Daw 6/15/01 Running KINOV_7 on plane element for storms from first 50 yrs.

From the Run Tables shown on pp 22-24 38 of the events resulted in less than 1 mm of runoff from the single plane element. It seems safe to assume that these events are insignificant. It should be noted that some of these events could have caused significant runoff from the roads and disturbed areas.

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File naming strategy for runs with entire watershed Requirements:

1) Easy to relate to runs with plane element
2) File name must distinguish between the first 50 yrs and 2nd 50 yrs., because runoff events could occur on the same day and year of the simulation

run #

One Solution: SW_AXX.FIL and .OUT for 1st 50 yrs
SW_BXX.FIL " .OUT " 2nd 50 yrs
The run number will be the same as for the planes.

output files will be written to subdirectory OUT_A

Daw 6/19/01

Completed the control files for Upper Split Wash, first 50 yrs. A-series All control files are in directory NEWSPLIT

Daw 6/22/01

All computer runs for the first 50 yr. sequence are completed All output files are in directory OUT_A
Results of computer runs are summarized in the runtables, p 26→28.

Daw 6/22/01 Tables of Runs for Upper Split Wash
First 50 yrs. (Series A)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_2 YUCSIMA simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm / Chan. F mm	QA mm/h / TA, min.
SW_A1	KIN00_7	—				—	
SW_A2 ✓	KIN00_7 6/18/01	JUL09_02	DETJ_0	SW_A2		2.14 / 0.085	5.82 / 34 min
SW_A3	KIN00_7	—				—	
SW_A4 ✓	6/19/01	~~MAY 02~~ JUN28_05	DETM_J			3.11 / 0.15	10.74 / 18 min
SW_A5		—				—	
SW_A6 ✓		JUN02_06	DETM_J			1.13 / .06	4.85 / 10 min
SW_A7 ✓		SEP18_06	DETJ_0			.60 / .05	1.19 / 20 min
SW_A8		—				—	
SW_A9		—				—	
SW_A10		—				—	
SW_A11		—				—	
SW_A12		—				—	
SW_A13		—				—	
SW_A14 ✓		OCT05_11	DETJ_0			8.31 / .20	33.01 / 16 min
SW_A15		—				—	
SW_A16 ✓	6-19-01	AUG08_15	DETJ_0			2.10 / .08	3.41 / 212 min

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm / Chan. F mm	QA mm/h / TA, min.
SW_A17	KIN00_7 6-19-01	—				—	
SW_A18 ✓		MAY29_17	DETM_J			8.74 / .18	36.68 / 10 min
SW_A19 ✓		SEP20_17	DETJ_0			6.72 / .18	27.43 / 14 min
SW_A20 ✓		APR29_18	DETJ_AC			.09 / .04	.12 / 20 min
SW_A21 ✓	KIN00_7 6/18/01	JUL12_18	DETJ_0	SWA21		5.64 / .16	10.48 / 18 min
SW_A22 ✓	〃	JUL13_18	〃	SW_A22		3.88 / .13	12.10 / 30 min
SW_A23 ✓	〃	JUL24_18	〃	SW_A23		9.69 / 0.19	37.19 / 34 min
SW_A24 ✓	6-19-01	JUN30_19	DETM_J			6.17 / .18	27.22 / 26 min
SW_A25	KIN00_7	—				—	
SW_A26	KIN00_7	—				—	
SW_A27 ✓	KIN00_7 6/19/01	~~JUL 04~~ AUG14_24	DETJ_0			3.37 / .11	4.72 / 26 min
SW_A28 ✓	〃	JUL20_25	DETJ_0	SW_A28		5.01 / .12	20.19 / 30 min
SW_A29 ✓	〃	JUL21_25	〃	SW_A29		10.15 / .23	16.37 / 112 min
SW_A30	〃	—				—	
~~SW_A31~~ No Runoff	〃	JUL22_26	DETJ_0			—	
SW_A32 ✓	〃	NOV05_26	DETN			.68 / .08	1.91 / 114 min

Note: If there is a line (—) in the rain file column it means that the runoff from the single plane element was negligible so the run was not made for the entire watershed

Daw 6/22/01 Upper Split Wash Tables (cont'd)

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm / Chan. F mm	QA mm/h / TA, min.
SW_A33		—				—	
SW_A34 ✓	KIN00_7 6-19-01	JUN26_30	DETM_J			3.14 / .13	13.78 / 22 min
SW_A35		—				—	
SW_A36 ✓	KIN00_7 〃	JUL30_31	DETJ_0	SW_A36		3.06 / .11	11.41 / 12 min
SW_A37 ✓	〃	JUL07_32	〃	SW_A37		6.00 / .17	18.17 / 20 min
SW_A38 ✓	〃	AUG14_32	DETJ_0			1.23 / .08	3.65 / 180 min
SW_A39 ✓	KIN00_7 6/22/01	MAY16_33	DETM_J			~~3.01~~ 3.77 / ~~0.28~~ .48	7.66 / 12 min
SW_A40		—				—	
SW_A41 ✓	6-19-01	MAR08_37	DETM_J			2.15 / .08	8.47 / 24 min
SW_A42		—				—	
SW_A43		—				—	
SW_A44		—				—	
SW_A45 ✓	6-19-01	NOV24_46	DETN			3.04 / .08	4.14 / 108 min
SW_A46		—				—	
SW_A47 ✓	6-19-01	AUG09_47	DETJ_0			1.34 / .06	2.30 / 46 min
SW_A48	KIN00_7	JUL24_49	DETJ_0			—	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm / Chan. F mm	QA mm/h / TA, min.
SW_A49 ✓	KIN00_7 6-19-01	JUL23_50	DETJ_0			7.81 / .19	36.85 / 10 min
SW_A50 ✓	〃	SEP13_50	DETJ_0			11.00 / .27	65.85 / 8 min
SW_A51 ✓	〃	DEC19_03	DETD			5.45 / .11	1.34 / 434 min
SW_A52 ✓	6/22/01	FEB26_03	DETJ_AC			~~10.05~~ 6.06 / 6.10 .02	10.25 / 124 min
SW_A53		—				—	
SW_A54 ✓	6-19-01	DEC10_07	DETD			6.34 / .17	17.34 / 30 min
SW_A55		—				—	
SW_A56 ✓	〃	DEC25_09	DETD			4.51 / .08	1.34 / 2970 min
SW_A57		—				—	
SW_A58 ✓	〃	MAR26_14	DETJ_AC			.60 / .07	.98 / 120 min
SW_A59 ✓		DEC11_14	DETD			1.03 / .09	1.08 / 340 min
SW_A60 ✓		JAN21_14	DETJ_AC			1.40 / .07	.45 / 1802 min
SW_A61 ✓		JAN18_15	DETJ_AC			.04 / .01	.07 / 730 min
SW_A62		—				—	
SW_A63 ✓	〃	FEB03_16	DETJ_AC			.15 / .06	.07 / 630 min
SW_A64 ✓	〃	DEC28_18	DETD			.27 / .08	.08 / 2440 min

Dan 6/22/01 Upper Split Wash Tables (Cont)
First 50 yrs

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_A65		—				—	
SW_A66		—				—	
SW_A67 ✓	KIN00-7 6-19-01	JAN16_23	DETJ_AC			2.99 .11	1.16 226 min
SW_A68 ✓		MAR13_25	DETJ_AC			3.60 .14	1.18 810 min
SW_A69 ✓		DEC20_25	DETD			.04 .02	.07 730 min
SW_A70 ✓		FEB26_25	DETJ_AC			2.19 .10	.30 1880 min
SW_A71 ✓		JAN01_26	DETJ_AC			.01 .01	.01 574 min
SW_A72 ✓		FEB08_28	DETJ_AC			.08 .04	.08 80 min
SW_A73		—				—	
SW_A74 ✓	↓	DEC25_33	DETD			2.99 .08	1.39 436 min
SW_A75		—				—	
SW_A76		—				—	
SW_A77		—				—	
SW_A78		—				—	
SW_A79		—				—	
SW_A80		—				—	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_A81		—				—	
SW_A82 ✓	KIN00-7 6-19-01	MAR09_41	DETJ_AC			3.49 .13	8.54 26 min
SW_A83 ✓		FEB27_41	DETJ_AC			12.35 .15	6.11 360 min
SW_A84 ✓		JAN14_42	"			4.95 .14	1.71 2880 min
SW_A85 ✓		DEC28_46	DETD			.06 .02	.06 620
SW_A86 ✓		JAN17_46	DETJ_AC			.07 .03	.11 384 min
SW_A87 ✓	↓	MAR06_49	DETJ_AC			.11 .04	.03 1906 min
SW_A88		—				—	
SW_A89		—				—	
SW_A90							
SW_A91							
SW_A92							
SW_A93							
SW_A94							
SW_A95							
SW_A96							

Dan 6/22/01 Prepare KINEROS Precipitation input files for second 50yr. sequence

1. Program COND7_3B.BAS to extract storms with depth > 12.7 mm in summer and storms t sequences with depth > 25.4 mm in winter

Input file is YUCSIMB.PTR

Output files are: YUCBSUM.CON
YUCBWIN.CON

Results 83 summer days with rain > 12.7 mm
39 winter sequences with rain > 25.4 mm
Dan 6/22/01

2. Now use program ~~DADIS~~ DAYDIS4.BAS with YUCBSUM.CON as input

Get YUCBSUM.DUR as output

3. Now run program RAINSIM6.BAS with YUCBSUM.DUR as input
All files of form MONDAY_YR.PRE are in YUCP_B_S
Also copied to floppy disk directory BSERIES

4 Run these precipitation files with the single plane element. Summary output files will be in subdirectory PLANTSTB and will be of the form. SW_PB1.OUT, SW_PB2.OUT etc

6/23/01 Dan
Edit YUCBWIN.CON to account for sequences of wet days > 4.

DAW 6/25/01 Second 50yr Simulation

1. Create control files for "summer" storms
Control files of form SW_PB1.FIL and are in directory NEWSPLIT

DAW 6/26/01 Disaggregate DEC-MAR storms

1. Input file is YUCBWIN2.CON and notation's of daily amounts for 3-day events.

Program is DAYDIS4.BAS

OUTPUT FILE IS YUCBWIN2.DUR

2. RUN PROGRAM RAINSIMG.BAS with YUCBWIN2.DUR as input. .PRE files will be placed in directory YUCP_B_W
Random number seed 5129
Threshold depth 25.4

3. Edit files with 3 days of rainfall to approximate the daily distributions

Run KINEROS with summer storms, Series B
22 of the 56 storms had runoff < 1 mm

Output summary table on pp 32-34

DAW 6/27/01 Second 50yr. Simulation (Con't)

1. Create control files for winter (Dec.-Mar.) storms for single plane element

2. Run KINEROS2 for these storms
Output is in ~~YUCBWIN~~ DAW 6/27/01 PLANTSTB

3. Create control files for Upper Split Wash Model

Control files are in NEWSPLIT and are of the form SW_BXX.fil xx is run number
Run KINEROS2 for summer storms:
Summary table on pages 35-37

DAW 6/28/01

Complete control files

Upper Split Wash runs, KINOU-7, winter (Dec-Mar) Series B.

Daw 6/26/01 Summary of Single Plane Runs with Series B, 50 yr. precipitation simulation

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_2 YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QB mm/h TB, min.
SW_PB1	KIN00_7 6/26/01	NOV11_02	TEST_N.PAR	SW_PB1		<0.01	
SW_PB2	KIN00_7 6/26/01	APR14_03	TESTJ_A	SW_PB2		5,35	
SW_PB3	KIN00_7	AUG02_03	TESTJ_0	dtr.		7.33	
SW_PB4		JUL06_05	TESTJ_0			3,35	
SW_PB5		JUL31_05	TESTJ_0			7,26	
SW_PB6		JUL02_06	TESTJ_0			7.39	
SW_PB7		JUL03_06	TESTJ_0			,81	
SW_PB8		JUL26_06	TESTJ_0			7.39	
SW_PB9		AUG18_06	TESTJ_0			6.53	
SW_PB10		OCT24_08	TESTJ_0			.01	
SW_PB11		OCT25_08	11			.72	
SW_PB12		OCT02_09	11			.50	
SW_PB13		NOV19_09	TEST_N			14.91	
SW_PB14		NOV21_09 JULY 6/26/01	TEST_N			<.01	
SW_PB15	DK	AUG11_10 ~~AUG11_10~~	TESTJ_0			2.05	
SW_PB16	6/26/01	APR10_11	TESTJ_A			20.06	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB17	6/26/01	AUG08_11	TESTJ_0	SW_PB17		3.86	
SW_PB18		APR02_12	TESTJ_A	dtr		8,98	
SW_PB19		APR06_13	TESTJ_A			.46	
SW_PB20		JUL16_17	TESTJ_0			1.24	
SW_PB21		JUL07_18	TESTJ_0			5.63	
SW_PB22		OCT31_20	11			1.66	
SW_PB23		SEP18_21	11			4.62	
SW_PB24		OCT06_22	TESTJ_0			1.49	
SW_PB25	KIN00_7	JUL30_24	TESTJ_0			4.59	*
SW_PB26	KIN00_7	APR02_25	TESTJ_A			0	
SW_PB27	KIN00_7	AUG06_26	TESTJ_0			12.88	ROVol mm (12.88)
SW_PB28		OCT28_26	11			.13	
SW_PB29		APR12_29	TESTJ_A			0	
SW_PB30		AUG14_32	TESTJ_0			.13	
SW_PB31		AUG22_32	TESTJ_0			.97	
SW_PB32		JUL10_33	TESTJ_0			2.38	

Daw 6/26/01 Series B, Single Pane Runs (Cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_2 YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB33	6/26/01	AUG17_33	TESTJ_0	SWPB_33		8.93	
SW_PB34	KIN00_7	AUG18_33	TESTJ_0	dtr		6.36	
SW_PB35		AUG22_33 6/26/01	TESTJ_0			7.31	
SW_PB36	DK	~~AUG23_33~~ OCT	11			.02	
SW_PB37		JUN19_34	TESTM_J			6.47	
SW_PB38		NOV26_35	TEST_N			<.01	
SW_PB39		NOV23_37	TEST_N			<.01.	
SW_PB40		NOV25_37	TEST_N			1.48	
SW_PB41		JUL18_38	TESTJ_0			11,53	
SW_PB42		SEP15_38	11			7.67	
SW_PB43		SEP08_39	11			5.98	
SW_PB44		JUN09_40	TESTM_J			.55*	
SW_PB45		JUL24_41	TESTJ_0			7.78	
SW_PB46		NOV15_41	TEST_N			3,05	
SW_PB47		OCT21_42	TESTJ_0			<.01	
SW_PB48		APR20_44	TESTJ_A			0	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB49	6/26/01	OCT11_44	TESTJ_0	SW_PB49		<.01	
SW_PB50	KIN00_7	JUN18_45	TESTM_J	dtr		1.38	
SW_PB51		JUL12_45	TESTJ_0			3.53	
SW_PB52		OCT22_46	11			19,15	
SW_PB53		OCT09_47	11			.81	
SW_PB54		APR05_48	TESTJ_A			<.01	
SW_PB55		SEP30_48	TESTJ_0			2.08	
SW_PB56	6/26/01	NOV29_48	TEST_N			0.	← End of summer
SW_PB57		JAN29_01	TESTJ_A			19.57	
SW_PB58		MAR30_02	11			3,51	
SW_PB59		JAN25_02	TESTJ_A			2.91	
SW_PB60		DEC29_04	TESTD			0	
SW_PB61		FEB22_04	TESTJ_A			3.77	
SW_PB62		FEB17_05	11			7.97	
SW_PB63		MAR08_06	TESTJ_D			1.39	
SW_PB64		DEC15_17	TESTD			1.95	

DAW 6/27/01 Single Plane Runs, Series B. (Cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_2
YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB65	6/27/01	MAR16_16	TEST_A	SWPB65		.59	
SW_PB66	KIN00_7	DEC25_17	TEST_D	ctv		8.17	
SW_PB67		JAN18_18	TEST_A			9.72	
SW_PB68		DEC24_21	TEST_D			0	
SW_PB69		JAN13_21	TEST_A			.07	
SW_PB70		JAN31_21	"			.60	
SW_PB71		FEB19_22	"			3.36	
SW_PB72		MAR22_24	TEST_A			10.97	
SW_PB73		JAN02_27	TEST_A			.49	
SW_PB74		MAR02_28	"			16.55	
SW_PB75		JAN03_28	TEST_A			.10	
SW_PB76		DEC29_29	TEST_D			.40	
SW_PB77		JAN02_30	TEST_A			33.46	
SW_PB78		JAN23_30	"			4.50	
SW_PB79		MAR17_31	"			.53	
SW_PB80		FEB17_31	"			2.27	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB81	KIN00_7 6/27/01	DEC08_33	TEST_D	SW1PB81		3.51	
SW_PB82		DEC21_33	"	ctv		.76	
SW_PB83		JAN06_33	TEST_A			9.60	
SW_PB84		JAN31_33	"			7.82	
SW_PB85		FEB06_34	"			2.24	
SW_PB86		JAN06_35	TEST_A			1.11	
SW_PB87		DEC29_36	TEST_D			<.01	
SW_PB88		FEB18_36	TEST_A			3.45	
SW_PB89		FEB28_36	"			8.16	
SW_PB90		JAN21_39	TEST_A			9.54	
SW_PB91		DEC07_41	TEST_D			0	
SW_PB92		DEC13_41	"			.38	
SW_PB93		JAN27_41	TEST_A			1.62	
SW_PB94		FEB02_46	"			12.67	
SW_PB95		FEB21_46	"			9.58	
SW_PB96		MAR09_47	TEST_A			6.86	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_PB97	KIN00_7 6/27/01	JAN11_48	TEST_A	SW_PB97		1.81	
SW_PB98		FEB12_49	"	ctv		.14	
SW_PB99		MAR05_50	TEST_A			1.46	
SW_PB100		MAR20_50	"			14.01	
SW_PB101							
SW_PB102							

DAW 6/27/01 Summary of Upper Split Wash Runs with Series B. 50yr precipitation

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_4
YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QB mm/h TB, min.
SW_B1	KIN00_7 6/27/01				Runoff	from plane	& 1 mm
SW_B2	KIN00_7	APR14_03	DETJ_AC			4.17 0.24	9.2 mm/h 34 min
SW_B3	KIN00_7	AUG02_03	DEJ_0			6.76 .17	17.8 20
SW_B4		JUL06_05	"			2.52 .10	7.56 14.0
SW_B5		JUL31_05	"			6.72 .15	24.0 16.0
SW_B6		JUL02_06	"			5.73 .18	20.55 18.0
SW_B7							
SW_B8		JUL26_06	DETJ_0			4.36 .17	14.10 13.0
SW_B9		AUG18_06	DETJ_0			6.09 .12	10.89 70.0
SW_B10							
SW_B11							
SW_B12							
SW_B13		NOV19_09	DET_N			0	
SW_B14							
SW_B15		AUG11_10	DETJ_0			1.28 .08	4.76 63.0
SW_B16	6/27/01	APR10_11	DETJ_AC			0 <.01	

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B17	6/27/01	AUG08_11	DETJ_0			3.07 .12	9.84 8.0
SW_B18	KIN00_7	APR02_12	DETJ_AC			6.66 .19	20.13 16.0
SW_B19							
SW_B20		JUL16_17	DETJ_0			.91 .06	1.58 22
SW_B21		JUL07_18	"			4.98 .13	13.66 52
SW_B22		OCT31_20	"			1.10 .06	1.78 40
SW_B23		SEP18_21	"			4.21 .11	14.47 44
SW_B24		OCT06_22	DETJ_0			.84 .07	1.49 54
SW_B25	KIN00_7	JUL30_24	DETJ_0			2.49 .08	7.67 74
SW_B26	KIN00_7						
SW_B27	KIN00_7	AUG06_26	DETJ_0			12.0 .20	52.0 5.0
SW_B28							
SW_B29							
SW_B30							
SW_B31							
SW_B32		JUL10_33	DETJ_0			2.02 .08	3.32 78

Daw 6/27/01 Upper Split Wash Watershed runs (cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_4 YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B33	KINDO_7 6/27/01	AUG17_33	DETJ_0			8.05 .14	21.7 62
SW_B34		AUG18_33	"			5.73 .13	11.19 86
SW_B35		AUG22_33	"			4.88 .17	13.21 84
SW_B36							
SW_B37		JUN19_34	DETM_J			4.92 .16	17 18
SW_B38							
SW_B39							
SW_B40		NOV25_37	DET_N			1.15 .08	3.2 220
SW_B41		JUL18_38	DETJ_0			10.87 .24	32.99 12
SW_B42		SEP15_38	"			7.23 .17	30.18 22
SW_B43		SEP08_39	"			5.60 .16	13.66 14
SW_B44							
SW_B45		JUL29_41	DETJ_0			7.25 .18	31.99 16
SW_B46		NOV15_41	DET_N			2.37 .13	6.05 176
SW_B47							
SW_B48							

Daw 6/28/01

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B49	KINDO_7 6/28/01						
SW_B50		JUN10_45	DETM_J			.93 .06	1.76 36
SW_B51		JUL12_45	DETJ_0			2.91 .10	5.45 40
SW_B52		OCT27_46	"			0 <.01	0 664
SW_B53							
SW_B54							
SW_B55		SEP30_48	DETJ_0			.89 .06	1.42 44
SW_B56							
SW_B57	KINDO_7 6/28/01	JAN29_01	DETJ_AC			4.20 0.10	1.76 220
SW_B58		MAR30_02	"			0.16 0.08	.06 370
SW_B59		JAN25_02	DETJ_AC			0.09 0.01	.09 728
SW_B60							
SW_B61		FEB22_04	DETJ_AC			0.27 0.06	.1 1998
SW_B62		FEB17_05	"			1.39 0.09	1.01 720
SW_B63		MAR08_06	DETJ_AC			0.10 0.03	.08 1806
SW_B64		DEC15_12	DETD			0.08 0.03	.05 3158

end of summer

Daw 6/29/01 Upper Split Wash Watershed Runs (cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPLIT\Runtable01_4 YUCSIMB simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B65	KINDO_7 6/29/01						
SW_B66		DEC25_17	DETD			2.99 0.10	4.71 32
SW_B67		JAN18_18	DETJ_AC			1.29 0.06	.53 1530
SW_B68							
SW_B69							
SW_B70							
SW_B71		FEB19_22	DETJ_AC			0.14 0.03	.31 202
SW_B72		MAR22_24	DETJ_AC			1.56 0.13	.35 2972
SW_B73							
SW_B74		MAR02_28	DETJ_AC			3.83 0.18	.4 3240
SW_B75							
SW_B76							
SW_B77		JAN02_30	DETJ_AC			10.77 .33	1.03 2340
SW_B78		JAN29_30	"			.21 .09	.07 340
SW_B79							
SW_B80		FEB17_31	"			.07 .01	.07 728

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B81	KINDO_7 6/29/01	DEC08_33	DETD			129 .04	.26 582
SW_B82							
SW_B83		JAN06_33	DETJ_AC			2.60 .14	.41 1980
SW_B84		JAN31_33	"			.82 .07	.73 546
SW_B85		FEB01_34	"			.14 .05	.08 1810
SW_B86		JAN06_35	"			.03 .02	6/29/01 .02 6.30
SW_B87						~~.20~~ ~~.07~~	
SW_B88		FEB18_36	"			.20 .07	.08 726
SW_B89		FEB28_36	"			.84 .08	1.0 504
SW_B90		JAN21_39	DETJ_AC			1.23 .06	.68 320
SW_B91							
SW_B92							
SW_B93		JAN27_41	DETJ_AC			.05 .03	.09 282
SW_B94		FEB02_40	"			2.50 .19	2.47 506
SW_B95		FEB21_46	"			.93 .08	.47 470
SW_B96		MAR09_47	DETJ_AC			1.16 .09	.72 562

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QA mm/h TA, min.
SW_B97	KINDO_7 6/29/01	JAN11_48	DETJ_AC			.13 .04	6/29/01 .14 3248
SW_B98						~~.18~~ ~~.08~~	
SW_B99		MAR05_50	DETJ_AC			.18 .08	.06 2356
SW_B100		MAR26_50	"			2.46 .12	3.23 234
SW_B101							

Daw 7/2/01 Link Upper Split Wash Model Results to TPA model

Procedures:

1. Modify program KINREAD2.BAS so that it reads a list of file names of KINEROS output files for the 100 yr. simulation (present day climate)
~~No~~ Daw 7/2/01 Revised program is KINREAD3.BAS
Included in the list will be the precipitation depth in mm and a code for season Apr-Nov code = 1, remainder of year code = 0. This will allow the precipitation that causes runoff to be summed by seasons as well as annually, so that annual averages can be calculated.
Output will be modified to print out a file of run designations with extension .DAT which will serve as input for program AVGCDF.BAS.

2. Modify program AVGCDF.BAS to read in the topographic class for each plane element
Class code: 0 for ridge
1 for steep slope
2 for toe of slope
Revised program is AVGCDF2.BAS
Also CDFs will be computed for infiltration and bedrock infiltration for each topographic class as well as for the entire watershed
Also CDFs for the entire watershed for summer and winter seasons will be calculated.

Daw 7/2/01 Link Upper Split Wash (cont)

KINREAD3.BAS
List of runfiles will have file name YUCSIM.LST
It is in directory NEWSPLIT

Make new directory CDF_FILES for CDF information

Daw 7/3/01

Output from KINREAD3.BAS

YUCSIM.LSP list of .DAT files (planes)
YUCSIM.LSC " " .CHN files (channels)

These files listed will be in either directory OUT_A or OUT_B, depending on the series.

Now AVGCDF.BAS. modified version is AVGCDF2.BAS

To calculate CDFs for each topographic class

Let: F_{ij} = total plane infiltration for plane i, storm j
Fr_{ij} = rock infiltration for plane i, storm j
P_j = precipitation for storm j
A_i = Area of plane i
Ave annual infiltration for plane $i = \sum_j F_{ij} / N = \bar{F}_i$

where N = number of years of record (100 in this case)

Total Watershed area $= \sum_i A_i = A_T$

Corresponding to each plane we have A_i/A_T and $\bar{F}_i$

Rank the F_{ij} in increasing order and sum the A_i/A_T for the CDF

DAW 7/3/01 Link Upper Split Wash Model to TPA model

For topographic classes, divide the plane elements into three classes; Ridge, Slope, toe of slope. Let an integer code TOPOG%(i) = 0, 1, 2 for each class respectively.

watershed subareas are:

$$\text{Ridge Area} = \sum_i (A_i \mid \text{TOPOG\%} = 0)$$

$$\text{Slope Area} = \sum_i (A_i \mid \text{TOPOG\%} = 1)$$

$$\text{Toe of Slope} = \sum_i (A_i \mid \text{TOPOG\%} = 2)$$

The CDFs can then be calculated in the same manner as for the entire watershed except with fewer elements.

The CDF of "excess precipitation" is obtained by ordering $\sum_j \frac{F_i}{N} - \sum \frac{P_j}{N}$. If there is no runoff or no runon this quantity $\equiv 0$.

DAW 7/5/01

File with element numbers and areas (planes) is DMODEL.PRN
Create new file with topographic classes DMODEL2.PRN

Topographic classification done visually from Figs 3-2 and 3-3 Woolhiser and Fedors, 2000

DAW 7/5/01

Now Create list file: ie file with output files from KINREAD3.BAS

Edit YUCSIM.LST

DAW 7/6/01

Complete YUCSIM.LST - A portion of the file is shown below. There are 114 output files that are read by KINREAD3.BAS

```
    Directory        File name  Precip season
C:\CONSULT\OUT_A\SW_A2.OUT,13.06,1
C:\CONSULT\OUT_A\SW_A4.OUT,20.55,1
C:\CONSULT\OUT_A\SW_A6.OUT,16.12,1
C:\CONSULT\OUT_A\SW_A7.OUT,15.43,1
C:\CONSULT\OUT_A\SW_A14.OUT,23.27,1
                                  ADR-NOV  DEC-MAR
C:\CONSULT\OUT_A\SW_A51.OUT,56.56,0
C:\CONSULT\OUT_A\SW_A52.OUT,56.59,0
C:\CONSULT\OUT_A\SW_A54.OUT,34.0,0
C:\CONSULT\OUT_A\SW_A56.OUT,56.10,0

C:\CONSULT\OUT_B\SW_B95.OUT,38.36,0
C:\CONSULT\OUT_B\SW_B96.OUT,38.23,0
C:\CONSULT\OUT_B\SW_B97.OUT,37.45,0
C:\CONSULT\OUT_B\SW_B99.OUT,39.09,0
C:\CONSULT\OUT_B\SW_B100.OUT,41.14,0
```

DAW 7/14/01 corrected mistakes in YUCSIM.LST

Run program KINREAD3.BAS
Total Runoff producing precipitation = ~~3308.32~~ 3313.48
Total in summer (Apr-Nov) = ~~1185.04~~ 1189.33
Total in winter (Dec-Mar) = ~~2123.32~~ 2124.15
Average per year = 33.~~08~~ 13 mm DAW 7/14/01
Program has created two lists of output files in NEWSPLIT: YUCSIM.LSP
YUCSIM.LSC

Daw 7/6/01 Link Upper Split Wash with TPA model

The output files listed are in directory OUT_A or OUT_B, depending on the rainfall series. Examples are shown below

Plane infiltration (mm)	Bedrock infiltration (mm)
71.793	0.000
35.028	0.000
69.628	5.828
76.087	0.000
74.076	0.000
74.080	0.000
43.116	11.216
36.032	0.000
86.191	0.000
78.947	0.000

↓
196 planes

Precipitation for this event was 71.95 mm

Planes are in order of computation

Portion of file SW_A83.DAT

Infiltration (m^3)
0.039
0.077
0.072
1.115
2.250
0.794
0.716
1.247

↓
20 channels

Channels are in order of computation

Portion of file SW_A83.CHN

Daw 7/9/01 Run Program AVGCDF2.BAS

For topographic classifications:

Ridge Area = 77,458 m^2
Slope Area = 154,082 m^2
Toe-of-slope Area = 25,255 m^2
Rock Infiltration = 0.845 mm/y over entire area (Daw 7/9/01)
= 1.27 mm/y over ~~0-66%~~ 66% of area

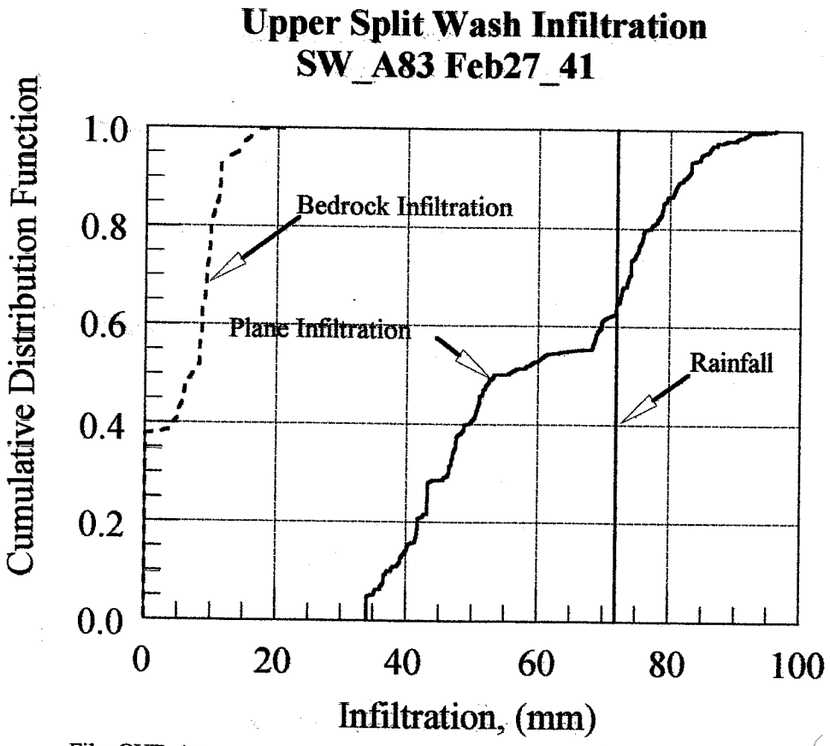
Daw 7/12/01 Get CDFs of infiltration for major storm events. The two largest winter events are SW-A83 (71.95 mm) and ~~SW8-77~~ SW-B77 (75.62 mm) Daw 7/12/01
Use program CDF2.BAS
Modify slightly to show directory structure

SW-A83 is in OUT-A
OUTPUT files will be in OUT-A
SW-A83.CDF
SW-A83.CHN
Rock infiltration 5.76 mm over entire area
9.29 mm over 62% of area
Runoff is 12.35 mm. Channel infiltration is 0.15 mm

SW-B77 is in OUT-~~B~~
OUTPUT FILES will be in OUT-B
SW-B77.CDF
SW-B77.CHN
Rock infiltration = 8.54 mm over entire area
12.84 mm over 66% of area
Runoff vol. is 10.77 mm. Channel Infiltration is 0.33 mm

CDFs of Bedrock and plane infiltration for these two events are shown on pages 44 and 45

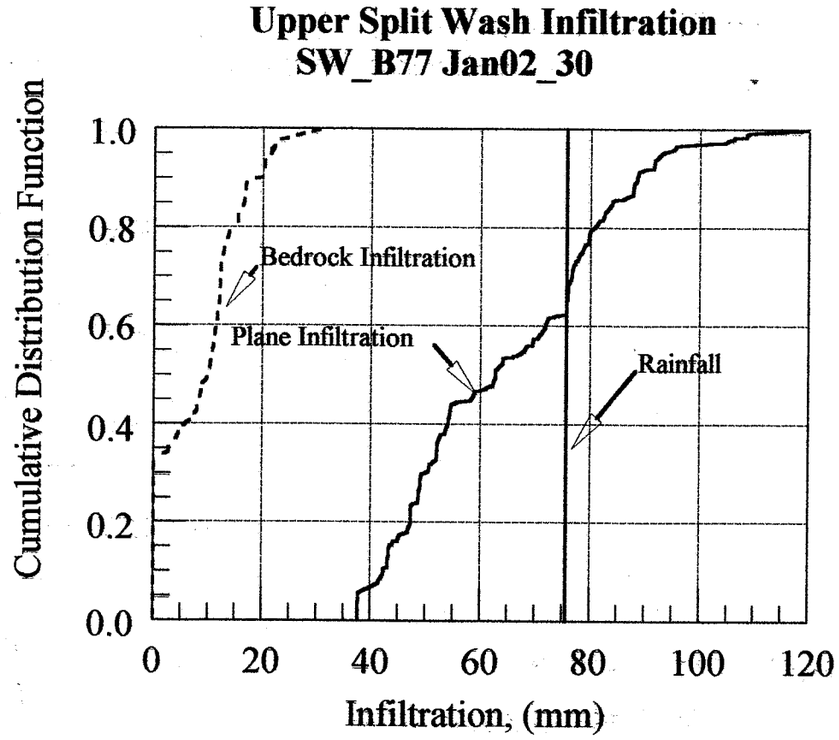
Daw 7/12/01 CDFs of Plane and Bedrock Infiltration for the two largest precipitation events in the 100 yr simulation, present climate.



File: OUT_AWA83CDF.PGW
daw 7/12/01

This figure shows that about 35% of the area had water running on to it (infiltration > rainfall) and that about 62% of the area became saturated. Although the total rainfall for this simulated event was smaller than the storm S18_95_2 (see p. 111 of scientific Notebook 362) the CDFs are similar.

Daw 7/12/01



File: OUT_B SWB77CDF.PGW
daw 7/12/01

This event had slightly more precipitation than SW_A83, resulting in more excess infiltration and bedrock infiltration. These figures show that for large storms with low rainfall intensities, that there can be substantial amounts of run-on. However, these large events are quite infrequent

Daw 7/13/01 Check Intensity-duration-Frequency Statistics for simulated precipitation.

Objective: To see of these statistics for the simulated rainfall are reasonable when compared with statistics from real data from nearby stations.

Procedure:

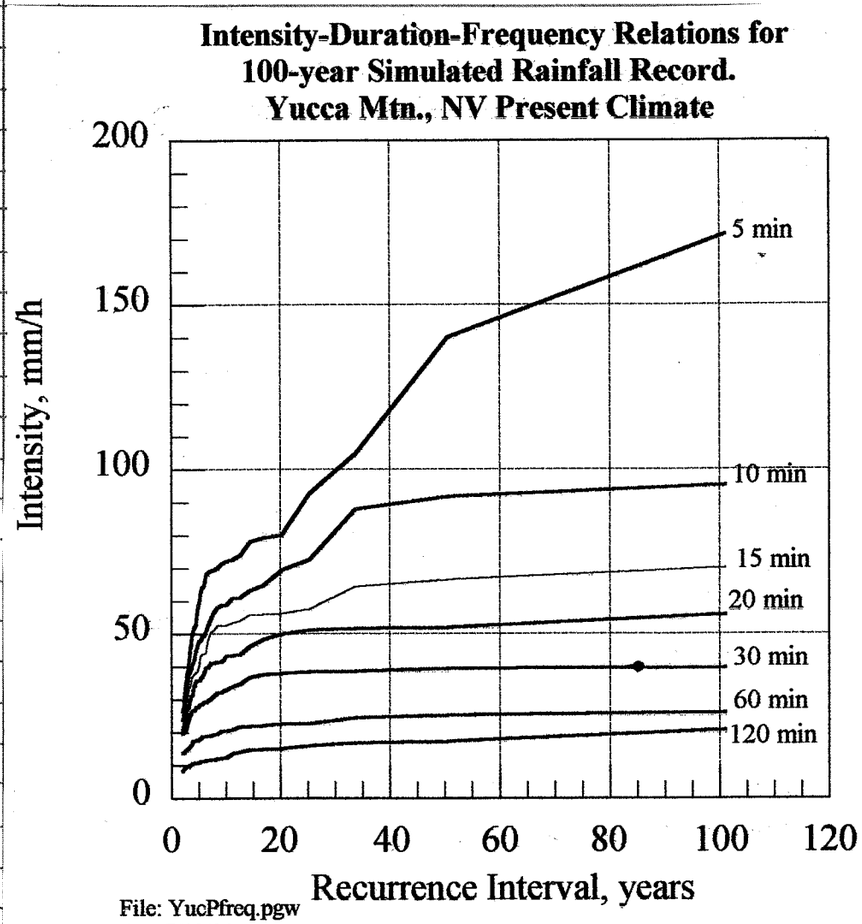
1) Combine the 5, 10, 15, 20, 30, 60 and 120 min intensities as given by YUCA5MM.MAX, YUCBSUM.MAX, YUCAWIN2.MAX and in files YUCBWIN2.MAX (Daw 7/13/01) into one file YUC100SW.MAX.

2) Import YUC100SW.MAX into PROSTAT and order each column in descending order. Calculate recurrence interval as 101/m where m is the rank. PROSTAT File is YUC100SW.PDW. These frequencies will be compared with those obtained by French (1983) for NTS well 5b and with those shown in the NOAA Atlas.

Depth-duration-frequency curves for the simulated data are shown on p 47. Although the mean annual precipitation for Upper Split Wash was greater than that used for the Solitario Canyon Study, the seasonal pattern is somewhat different (and more accurate since it is based on nearby stations) the 5-120 min intensities are much closer to those obtained by French (1983)

French, R.H. 1983. Precipitation in Southern Nevada. ASCE Journ. of Hydraulic Engineering, 109(7): 1023-1036.

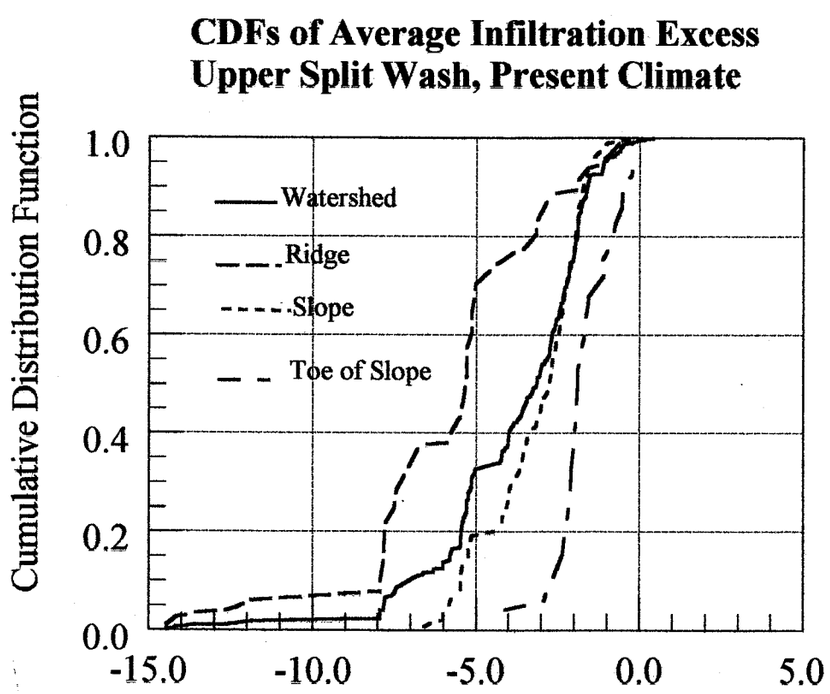
Daw 7/13/01



File: YucPfreq.pgw
daw 7/13/01

Continued on p. 52 Daw 7/31/01

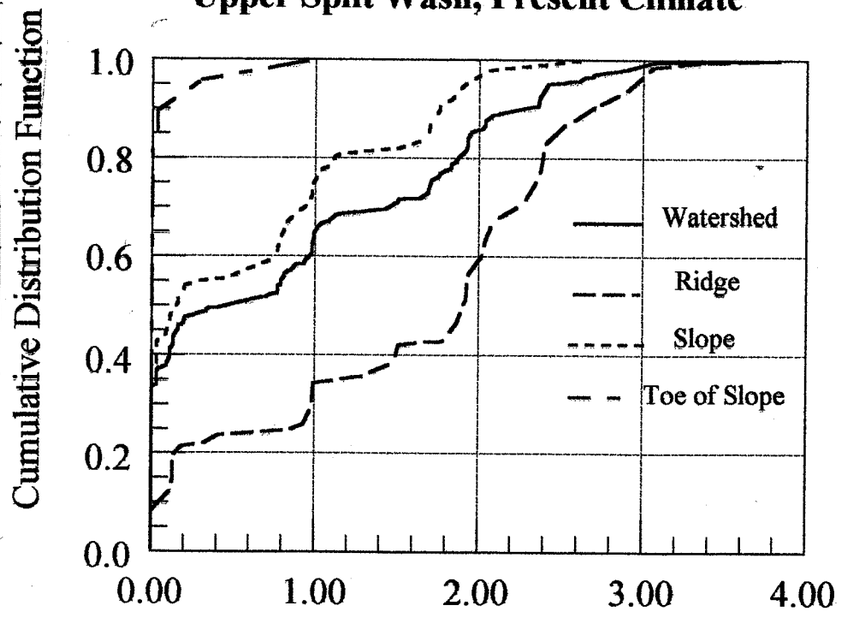
Daw 7/14/01 Average Infiltration CDFs



Although the CDFs for the Watershed for large, low-intensity storms show a positive infiltration excess (see p 44 and 45), the CDFs for the average annual excess shown above are predominantly negative, indicating runoff. This is due to the significantly greater Hortonian overland flow generated with the simulated 100 year precipitation sequence.

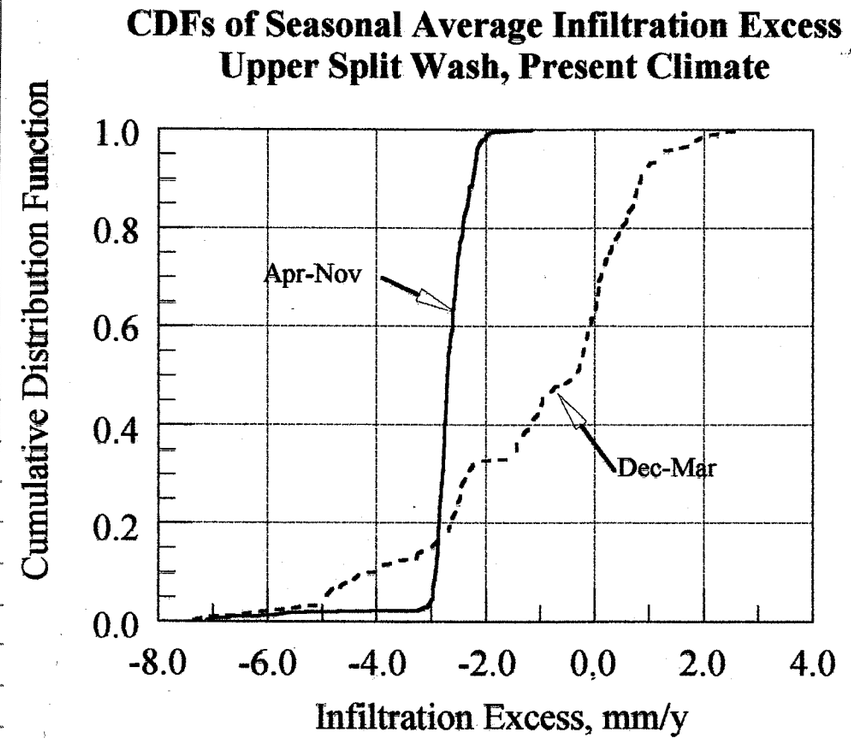
It is of interest to note the differences due to slope position, however. The toe-of-slope elements have less runoff (more infiltration) ~~than~~ DAW 7/14/01 than the ridge elements, while the slope elements are between.

Daw 7/14/01 Average Bedrock Infiltration CDFs



The CDFs of average annual bedrock infiltration show a substantial spatial variation with 80% of the watershed having less than 1.8 mm/yr. The toe-of-slope elements had virtually no bedrock infiltration, while about 40% of the area of ridge top elements had more than 2.0 mm/yr. However the bedrock infiltration was much less than for the 1987-95 period as shown on p 113 of Scientific Notebook 362, where 50% of the entire watershed had > 2 mm/yr. This may indicate that the 1987-95 period was very unusual, with the two large rainfall events in 1995.

Daw 7/14/01

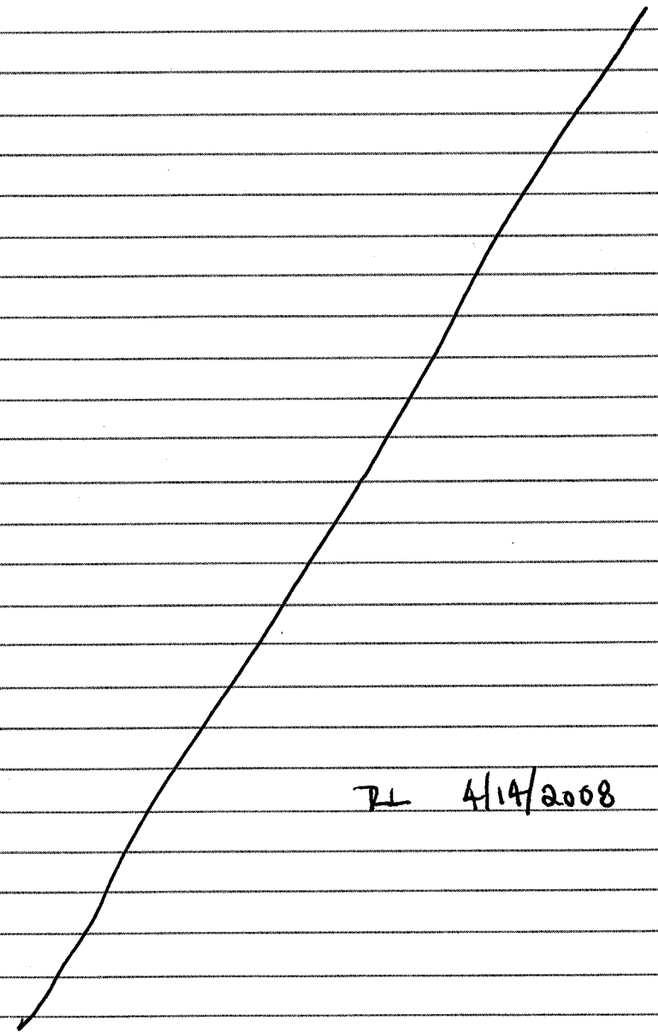


There is a strong seasonal effect as shown above. The negative mean annual infiltration excess for the Apr-Nov period reflects Hortonian overland flow which is generated on all plane elements, allowing the runoff-runon phenomenon only during recession or below disturbed areas. During the the Dec-Mar. period about 40% of the watershed area has some run-on

An examination of the bedrock infiltration on a seasonal basis revealed that none occured during Apr-Nov so the CDFs on p 49 show bedrock infiltration for Dec-Mar.

Daw 7/16/01 Obtain Individual and Average CDFs of Channel Infiltration

Note: In reviewing the parameter files, the option used for channel infiltration was WO = YES which means that the effective infiltrating width is a function of depth of flow. This should provide a lower bound for channel infiltration. The runs should be repeated with WO = NO to get the upper bound.



RL 4/14/2008

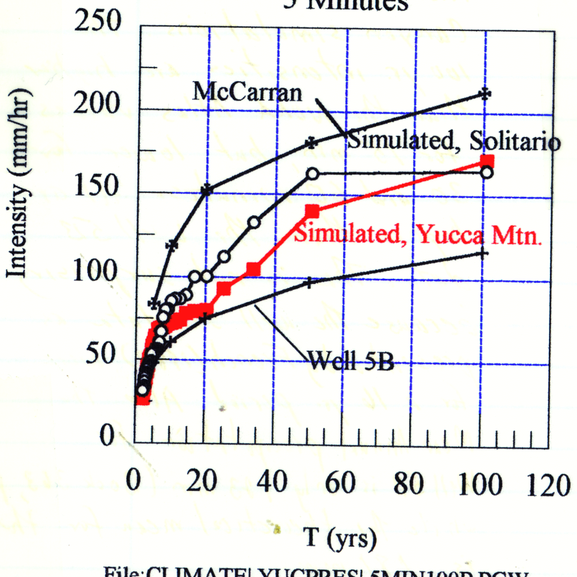
DAW 7/31/01 Check statistics for 100 yr. simulated precipitation record (Cont from p 46)

Intensity-duration-frequency.

Use the same procedures shown on p 123 of the Computational notebook, Solitario Canyon Water shed. Figures were created for 5, 10, 15, 20, 30, 60 and 120 min intensities and are in directory THIRD50. These curves are for the two 50yr sequences documented in the above notebook. The mean annual precipitation was 165 mm while the Yucca Mtn present day climate was 181 mm. There is also some difference in the seasonal distribution.

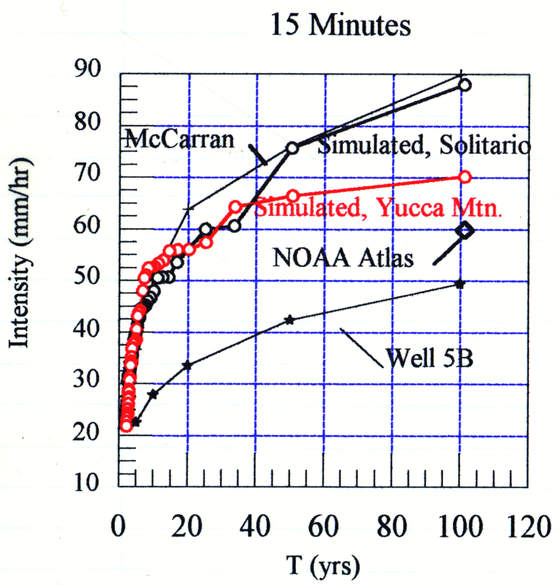
DAW 8/28/01

The above figures were created for the 100 yr. simulated record for Yucca Mountain - present climate. Files are in SWRI\CLIMATE\YUCPRES and are of the form: 5MIN100P.PGW, 10MIN100P.PGW, etc. where P refers to present climate. Intensity-Frequency relations are shown for 5, 15, 30 and 60 minute durations on pages 52 and 53. Similar curves for McCarran Airport at Las Vegas and Well 5B at NTS as presented by French (1983) are also shown as well as the curve for the Solitario Canyon precipitation simulations. The NOAA Atlas 100yr return values are also shown for durations of 15, 30 and 60 min. For durations of 5 and 15 min. the Yucca Mtn. simulations result in curves that are close to the Solitario Canyon simulations but with lower intensities at the 50 and 100yr return periods

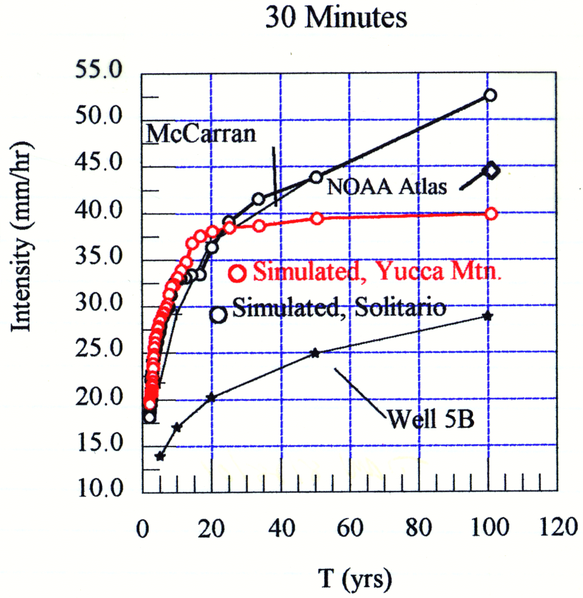


File:CLIMATE| YUCPRES| 5MIN100P.PGW
daw 7/31/01

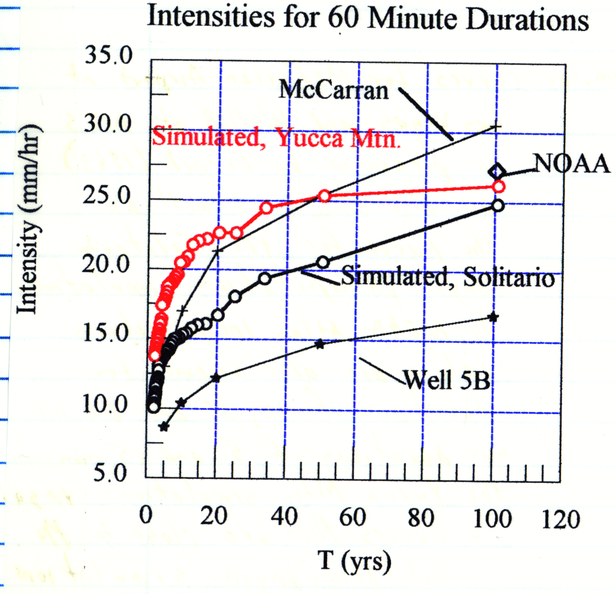
DAW 8/28/01 Intensity-duration-frequency statistics (cont)



File: CLIMATE|YUCPRES|15MIN100P.PGW
daw 7/31/01



File:CLIMATE|YUCPRES|30MIN100P.PGW
daw 7-31-01



File: CLIMATE|YUCPRES|60MIN100P.PGW
daw 7-31-01

However the intensities for 60 min are higher than those of the Solitario Canyon simulations. The 100 yr. intensities are higher than the NOAA Atlas values for 15 min; but lower for 30 and 60 minutes. All are higher than the Well 5B data. This is not surprising because the well 5B data as presented by French (1983) were for a 16 yr. period. Also the Mean Annual precipitation for Well 5B is only 123 mm (Book 363, p47) while the theoretical mean for the Yucca Mtn. simulations is 181 mm.

Daw 8/28/01 Intensity-duration-frequency statistics (Con't)

It should also be noted that the MAP for the Solitario Canyon simulations was 165 mm and the parameters for the Markov Chain-mixed exponential model were obtained from those at Las Vegas, NV and St. George UT using the program presented by Hanson et al (1994) See: Woolhiser, D.A., S.A. Stothoff and G.W. Wittmeyer (1998) Estimating Channel Infiltration from Surface Runoff in the Solitario Canyon Watershed, Yucca Mountain, Nevada. Report to Nuclear Regulatory Commission under Contract NRC-02-97-009. Center for Nuclear Waste Regulatory Analysis, San Antonio, TX.

Daw 8/29/01 Compare Monthly Statistics for Simulated record and nearby stations:

It appears most likely that the rather high intensities for 30 and 60 min durations are due to the daily rainfall disaggregation procedure. To examine this more closely, it is desirable to examine monthly statistics.

To facilitate graphical comparisons the programs CLISTAT.BAS and CLISTAT2.BAS were modified to write output statistics to a computer file rather than the printer. The revised programs are:

PSTAT01A.BAS - precipitation input is in inches
PSTAT01B.BAS - " " " " mm

The output files have the same name as the input files, but with the extension .STA

For comparisons of monthly rainfall totals, numbers of wet days, CDF's of total depths and daily depths, select 2 stations - 1 with lower MAP and 1 with MAP > 181 mm.

Yucca Dry Lake (File: YUCCA.PTT) has 173.25 mm (see p47 book 363). forty yr. record

Daw 8/29/01 Monthly Statistics (Con't)

Station 40 mi Canyon North (FORTYM~1.PTT) has 203.71 mm MAP with 40 yrs data. (See p44 book 363)

Use program PSTAT01A.BAS to compile statistics. Compute CDF's for daily precipitation for monthly periods for Mar, May, July, Sept, Nov, Jan.

Output files are: YUCCA.STA ✓
~~FORTY.STA~~ Daw 8/29/01 FORTYM~1.STA

Also use program PSTAT01B.BAS to compute statistics for Yucca Mountain simulations YUCSIMA.PTR and YUCSIMB.PTR (50 years each)

Output files are: YUCSIMA.STA and YUCSIMB.STA
All output files are in SWRI/CLIMATE/YUCPRES

To prepare graphs:

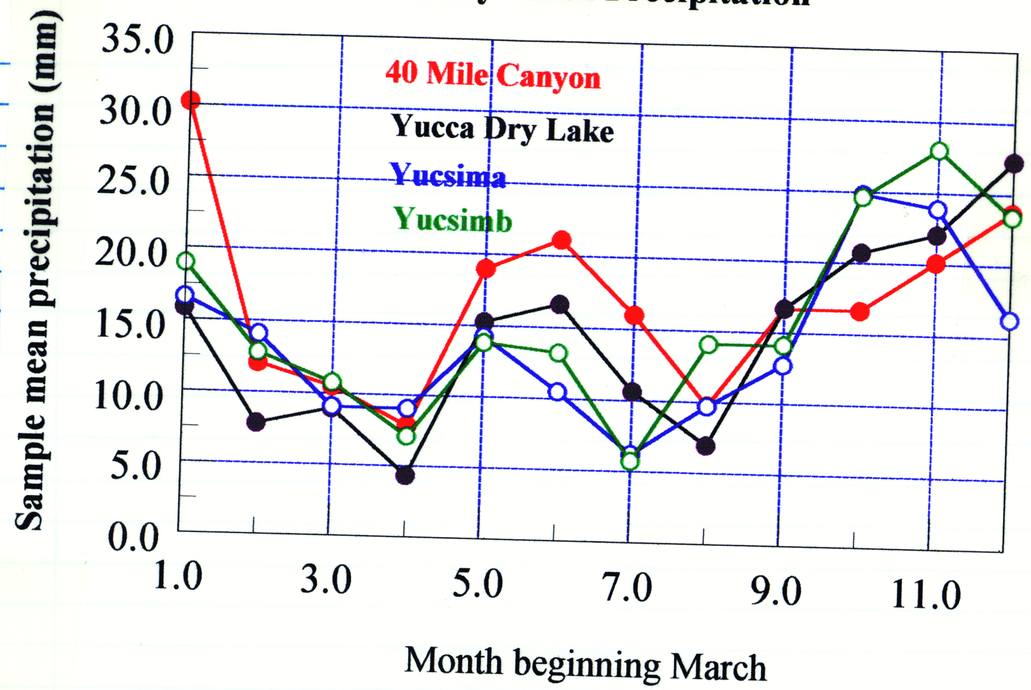
1) Extract the monthly statistics from each .STA file. File name will be the same with extension .MON Use MSDOS editor ✓

2) Plot Sample monthly mean precipitation, monthly mean number of wet days, and mean precipitation depth per wet day vs month beginning Mar = 1.

These plots are shown on pages 56 and 57.

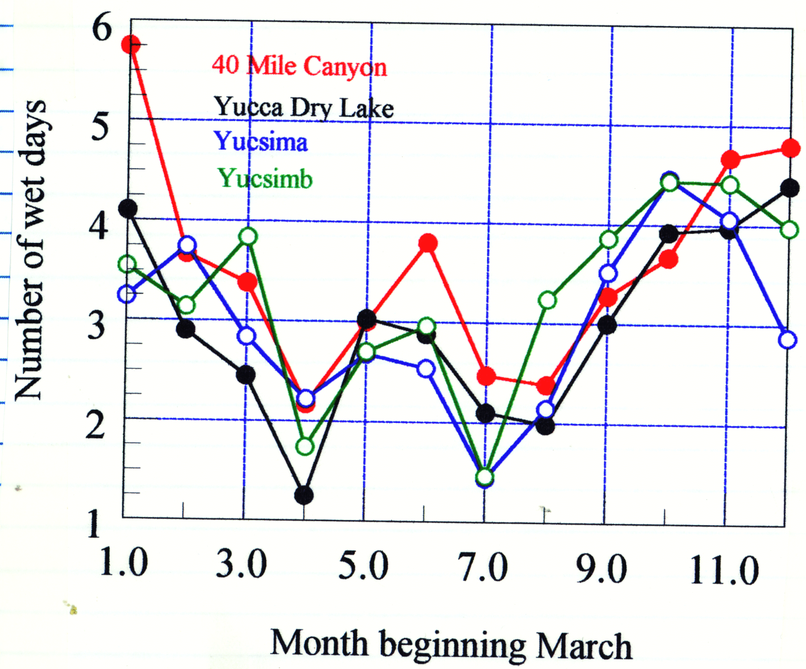
Although the general seasonal trends are preserved by the simulation model, there is a bias for August and Sept (low) and for Dec and Jan (high). The bias for Aug & Sept seems to be due primarily to the mean daily precipitation on a wet day

Monthly Mean Precipitation



File: CLIMATE|YUCPRES|MONTHLYP.PGW
daw 8-29-01

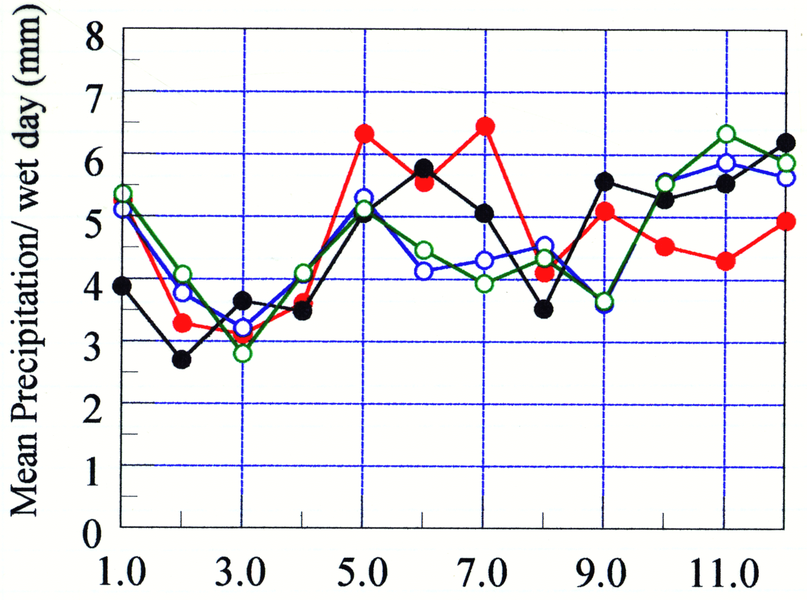
Sample mean number of wet days per month



File: CLIMATE|YUCPRES|MONTHNO.PGW
daw 8-29-01

daw 8/29/01

Sample mean depth of precipitation per wet day



File: CLIMATE|YUCPRES|MO_WET_P.PGW
daw 8-29-01

Because these deviations are greater than would be expected, the parameter file YUCTEST2.PAR was examined carefully and mistakes were detected. These are documented on pp 75 of notebook 363. These mistakes were corrected and 2 new 50 yr. simulations were performed. The new files are:

YUCSIMC.PTR and YUCSIMD.PTR

daw 9/4/01

See p 76 of notebook 363.
Statistical summary files YUCSIMC.STA and YUCSIMD.PTR were created with PSTAT01B.BAS and monthly files YUCSIMC.MON and YUCSIMD.MON were created with the MSDOS Editor.

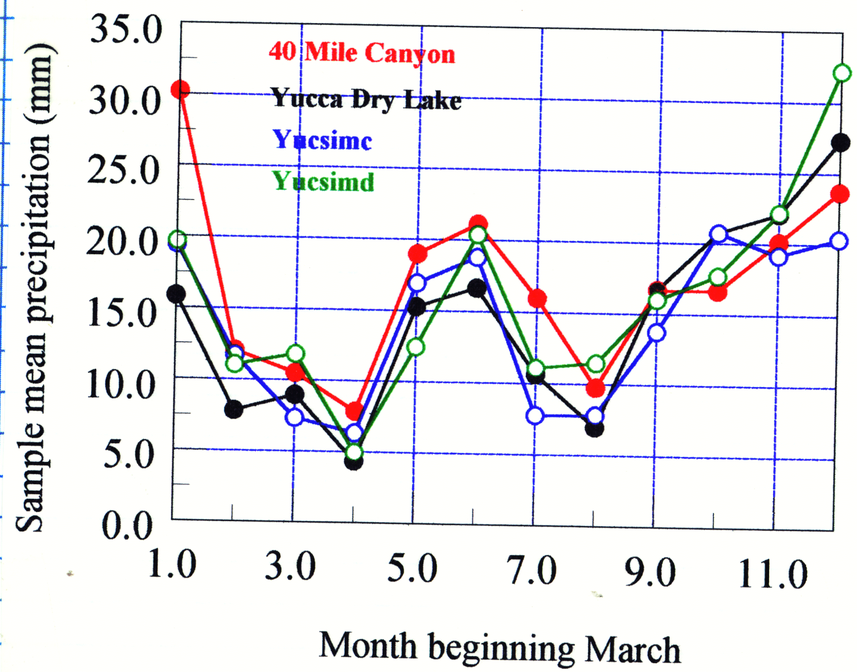
Daw 9/4/01 Checking Simulations (Con't)

The monthly statistics for the two 50 yr simulations are compared with measured data for 40 mile Canyon and Yucca Dry Lake, below and on p 59. It is apparent that the fit is quite acceptable. The simulated monthly means usually are between those for the nearby stations and sometimes bracket them. The differences for simulations with identical parameters is quite large in a few cases (especially period 12 - Feb) demonstrating sampling variability

Some summary statistics

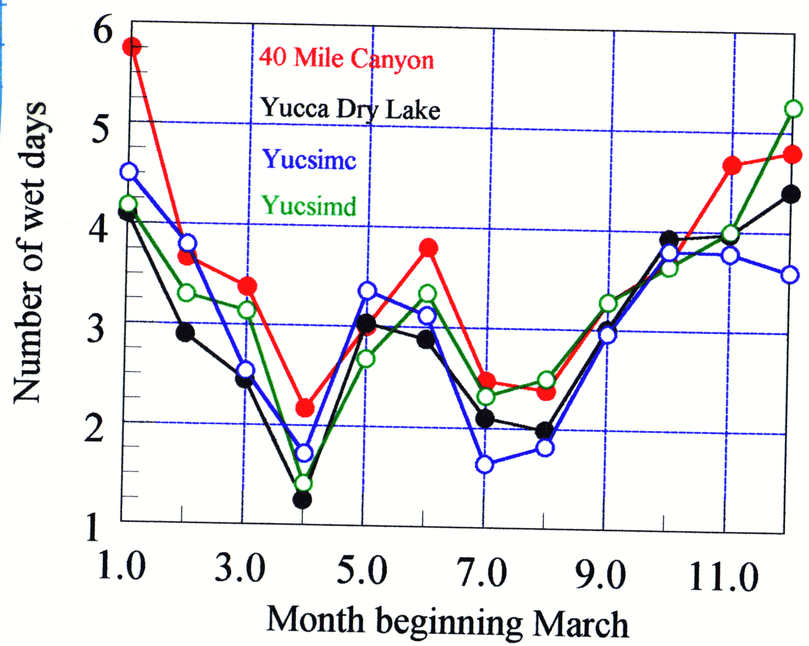
	MAP(mm)	std. dev	max	min	N(yrs)
YUCSIMC	170	52.1	306	71	50
YUCSIMD	191	58.4	399	100	50
FORTYMILE	204	88.6	374	67	40
YUCCA DRY LAKE	173	83.6	338	51	40

Simulated and Measured Monthly Mean Precipitation



File: CLIMATE|YUCPRES|MONTHP_2.PGW
daw 9-4-01

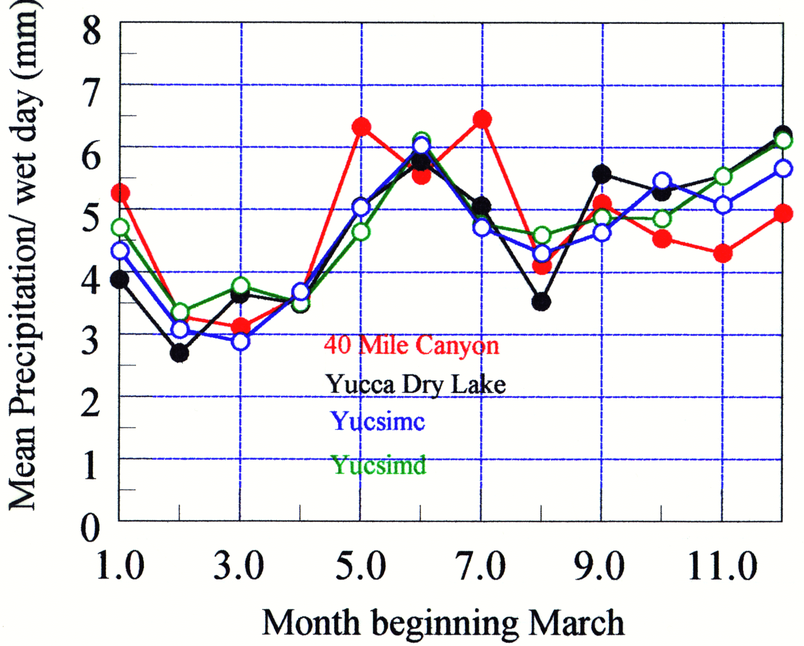
Simulated and Measured
Sample mean number of wet days per month



File: CLIMATE|YUCPRES|MONTHN_2.PGW
daw 9-4-01

Daw 9-4-01

Simulated and Measured
Sample mean depth of precipitation per wet day



File: CLIMATE|YUCPRES|MowetP_2.PGW
daw 9-4-01

daw 9/4/01 Checking simulations (Con't)

Objective: Examine empirical cdfs of total precipitation for months of Feb. and Aug.

With MSDOS editor extract cdfs, and name files

1. YUC12.CDF - Yucca Dry Lake
2. ~~YUCSIM12.CDF~~ daw 9/4/01 YUCSC12.CDF
3. YUCSD12.CDF

} for Feb.

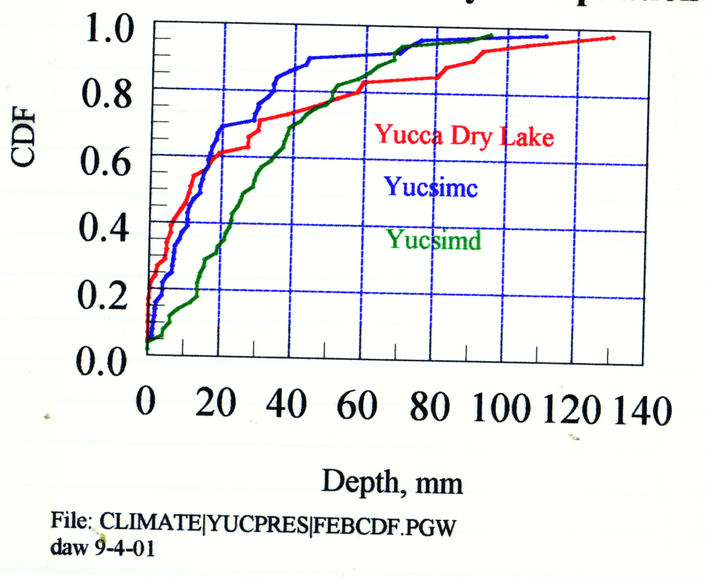
PSI Plot file: FEBCDF.PGW

4 YUC-6.CDF
5 YUCSC-6.CDF
6 YUCSD-6.CDF

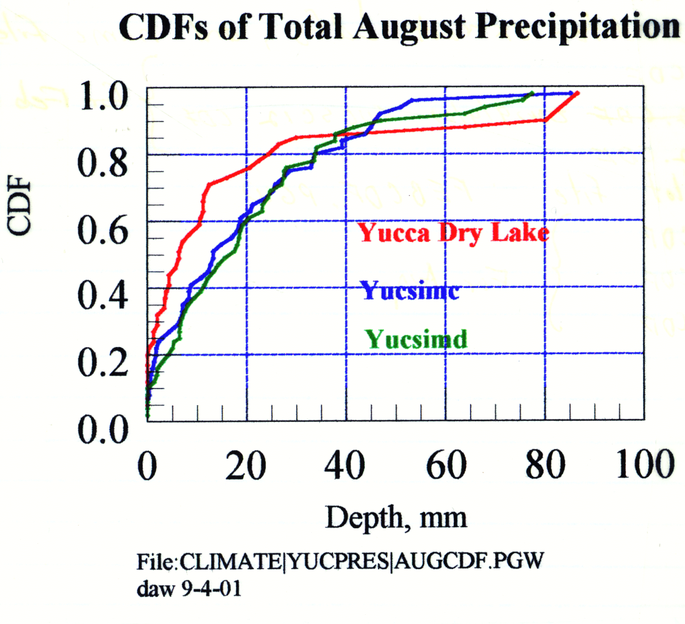
} Yucca Dry Lake For Aug

PSI Plot file AUGCDF.PGW

The CDFs of Feb. and Aug precipitation are shown below and on p 61. It is clear that the empirical distributions have heavier tails than the simulated distributions. From the figure on p 58 it is noted that this occurs for February even though the means of the simulated distributions bracket the mean for Yucca Dry Lake. The simulated means are greater



daw 9/4/01 Checking Simulations (Con't)



than the sample mean for Yucca Dry Lake for August, but, again, the sample distribution has a heavier tail. From the table on p.58 it is also evident that the simulated annual precipitation has a smaller coefficient of variation (std dev ÷ mean) than the sample values.

This reduction in variance of monthly and annual precipitation with annually periodic parameters has been noted previously (c.f. Woolhiser 1992)

Woolhiser, D.A. 1992 "Modeling Daily Precipitation - Progress and Problems" in Statistics in the Environmental and Earth Sciences A.T. Waldel and P. Guttorp (Eds), Edward Arnold p 71-89.

Unfortunately, much more complicated models with many more parameters are required to solve this problem. One approach has been described by Wilks (1989) while Woolhiser et al 1993 have used the Southern Oscillation Index (SOI)

Daw 9/4/01 Checking Simulations

to perturb the parameters of daily precipitation models.

Wilks, D.S. (1989) Conditioning stochastic daily precipitation models on total monthly precipitation. Water Resour. Res. 23(6) 1429-39.

Woulhiser, D.A., T.O. Keefer and K.T. Redmond. 1993. Effects of the Southern oscillation index on daily rainfall in the southwestern U.S. Water Resour. Res. 29(4) 1287-1295.

Daw 9/21/01 Checking Simulations (con't)

Although it would be possible to develop a stochastic daily precipitation model that would more closely preserve the variability, it may not be justified for two reasons

1.) The uncertainties involved in daily rainfall disaggregation and runoff modeling are probably greater sources of variability in the modeling results.
2.) A more complex model would require considerable time to develop and wouldn't be as amenable to modification for a change of climate

Conclusion: Accept the Markov chain-mixed exponential model

Daw 9/24/01 Documentation of computer files sent to R. Fedors

Directories set up for Upper Split Wash

Newsplit Mar-Sep01 9 directories 408 files

CDF file 16 files dated 7/9 - 7/17/2001
.CDF - data for CDFs of mean annual plant and channel infiltration

Out_a KINEROS output files for 50 yr precipitation series a. (153 files dated 6/18-7/14/2001)
Upper Split Wash
Out_b Kineros output files for 50 yr precipitation series b. (199 files dated 6/27 - 7/16/2001)
Upper Split Wash
Plantsta Kineros Output files for 50 yr. precipitation series a. Single plane element. (89 files 6/12-6/15/2001)
Plantstb Kineros Output files for 50 yr. precipitation series b. Single plane element (100 files 6/25-6/27/2001)
YUCP_a_S KINEROS precipitation files, Series A Apr - Nov. (53 files 5/26 - 6/17/2001)

YUCP_a_W Kineros precipitation files, Series A Dec - Mar (39 files 5/26 - 6/14/2001)

YUCP_b_S Kineros precipitation files, Series B Apr - Nov (56 files 6/22/2001)

YUCP_b_W Kineros precipitation files, Series B Dec - Mar (44 files 6/26/2001)

sent to Fedors 9/25/2001 Daw

Daw 10/10/01 Rainfall Disaggregation and Upper Split Wash runs for Daily Rainfall Sequences C and D

Set up new subdirectory C:\CONSULT\SWRI\SPLIT2

Create 4 sub directories
NEWSPLIT2

For 50 yr series C:
- YUCP_C_S - Includes all disaggregated "summer" storms
- YUCP_C_W

For 50 yr series D:
- YUCP_D_S - Includes all disaggregated "summer" storms
- YUCP_D_W

Where: YUC is YUCCA MOUNTAIN - Upper Split Wash
P refers to present climate
C and D refers to 50 yr. sequences. C & D
S is summer (Apr-Nov) and W is Dec-Mar

Simulated precipitation files are: YUCSIMC.PTR
YUCSIMD.PTR

YUCSIMC.PTR → COND7-3B.BAS → YUCCSUM.CON
YUCCWIN.CON

There were 90 summer days with depth > 12.7 mm
There were 29 winter wet sequences with depth > 25.4 mm

Daw 10/10/01 Continue Disaggregation

YUCSIMD.PTR → COND7_3B.BAS → ~~YUCSUM~~ YUCDSUM.CON
→ YUCDWIN.CON

There were 102 Summer Days with rain > 12.7 mm
" " 36 Winter Days with rain > 25.4 mm

Now disaggregate summer daily rainfall series C

YUCCSUM.CON → DAYDIS4.BAS → YUCCSUM.DUR
Random seed = 414

Now disaggregate summer daily rainfall series D

YUCDSUM.CON → DAYDIS4.BAS → YUCDSUM.DUR
Random seed = -417

Now disaggregate summer storms for series C

YUCCSUM.DUR → RAINSIM6.BAS → YUCCSUM.MAX
~~→ A:\MODAY_YR.PRE~~ Daw 10/10/01
→ A:\CSERIES\MODAY_YR.PRE
Random seed 414

Daw 10/12/01
Now disaggregate summer storms for series D

YUCDSUM.DUR → RAINSIM6.BAS → YUCDSUM.MAX
A:\DSERIES\MODAY.YR.PRE
RANDOM SEED = 1022

Daw 10/12/01 Rainfall Disaggregation (Con't)
Series C and D

Now edit winter storm *.CON files for consecutive wet days of 3 or greater.

1. Edit YUCCWIN.CON
Examine information line by line using MSDOS edit
(Use printed file - partial page shown below)

YUCCWIN.CON
Daw 10/12/01

Mo	Day	YR	Depth (mm)	7-day API	No of days	
FEB	18	3	59.08	6.08	2	
FEB	21	4	30.67	0.00	3	10.13 3.76 16.78 ✓
MAR	5	5	25.72	0.00	1	
DEC	6	7	32.87	0.00	2	
DEC	21	9	44.23	7.29	4	4.47 0.47 39.29
WET DAY SEQUENCE > 7 ENDS					MAR 23	13 10-day sequence } NS Total is 23.78
MAR	14	14	26.71	6.03	2	
JAN	9	14	34.22	0.00	4	0.79 23.08 10.35
MAR	14	17	28.71	1.35	2	
7-DAY WET SEQUENCE ENDS					DEC 10	21 12.03 0.52 12.96
MAR	28	23	40.01	9.72	3	24.67 5.40 9.94
JAN	8	23	32.64	0.38	1	

} Con't in file

The maximum 3-day sequences for wet day sequences of 3 or greater are selected and if they are > 25.4 mm will be disaggregated to create KINEROS input files.
These depths are obtained from the file YUCSIMC.PTR
The same procedures as described on pgs 20 and 21 of this notebook are used
Copy YUCCWIN.CON to YUCCWIN2.CON ✓
Copy YUCCWIN2.CON to YUCWIN3.CON and add daily totals for 3-day sequences
In YUCCWIN2.CON, Daily totals are added for 3-day sequences and are entered in the depth column. The date shown for multiday sequences is at the end of the sequence.

Daw 10/15/01 Rainfall disaggregation (Con't)

YUCWIN3.CON has the individual daily amounts on the same line. It is printed out to be used in conjunction with the storm disaggregation program RAINSIM6.BAS. The storm patterns generated by Rainsim6.BAS for 3-day events are rejected until they approximate the general patterns given by the 3-day sequences. YUCDWIN2.CON and YUCDWIN3.CON created DAYDIS4.BAS run for both C and D series, get *.DUR files

Daw 10/16/01
Adjusted time intervals in series C winter rainfall series. Three-day sequences only.

Files in NEWSPLIT2\YUCP.C_W and are of the form MODAYYR.PRE

2. Now adjust time intervals for series D. ✓

D series { Note: Random number seed used for DAYDIS4.BAS = -300
" " " " " RAINSIM6.BAS = 335 ✓
C series { " " " " " DAYDIS4.BAS = 420
" " " " " RAINSIM6.BAS = -420

Daw 10/17/01

Summary statistics for rainfall events
C series:
summer: 65 events > 12.7 mm
winter: 34 events > 25.4 mm in 1, 2, or 3 days

99/50 = 1.98/yr

D series:
Summer: 75 events > 12.7 mm
Winter: 46 events > 25.4 mm in 1, 2, or 3 days

121/50 = 2.42/yr.

Daw 10/17/01 Disaggregation (Cont)

Winter Wet day sequences

# of Days	Sequence C	Sequence D
1	4	9
2	9	10
3	10	12
4	6	5
5	1	5
6	2	2
7	1	4
77	3	2
Total	36	49

However some sequences did not have a 3-day sequence with total rainfall > 25.4 mm embedded in them so the net number of events are C: ~~35~~ 34 events and D: 46 events
Daw 10/17/01

Thus with both summer and winter events there are 220 events to consider for the 100 yr sequence.

Now check Intensity - Duration - Frequency statistics for simulated precipitation

Procedure (See p. 46 for procedures used for A+B series)

1. Use MSDOS Editor to combine YUCCSUM.MAX and YUCOSUM.MAX into a single file YUC100S2.MAX. This file then has maximum intensities for all storms in period Apr-Nov. These will certainly be the maximum amounts for 5, 10, 15, 20, 30 and 60 minute storms and may be maximum for 120 min storms as well
Create new directory in NEWSPLIT2 RAINSTAT

Daw 10/17/01 Intensity - Duration - Frequency statistics (Cont)

2) Import YUC100S2.MAX into PROSTAT and order each column in descending order

File is: CONSULT\SWRI\NEWSPLIT2\RAINSTAT\YUC100S2.PDW

Now open file CLIMATE/YUCPRES\5MIN100P.PGW

Plot 5 min intensity-frequency curve on it.
Save as YUC5MIN2.PGW

Daw 10/25/01

open YUC100S2.PDW
open CLIMATE\YUCPRES\15MIN100P.PGW
Plot 15 min. intensity-freq. curve
Save as YUC15MIN2.PGW

Open CLIMATE\YUCPRES\30MIN100P.PGW
Plot 30 min intensity-frequency curve
Save as YUC30MIN2.PGW

Open CLIMATE\YUCPRES\60MIN100P.PGW
Plot 60 \min intensity-frequency curve
Save as YUC60MIN2.PGW

Open CLIMATE\YUCPRES\120MINP.PGW
Plot 120 min intensity-frequency curve
Save as YUC120MIN2.PGW

The 5, 15, 30, 60 and 120 min intensity-frequency curves for the disaggregated daily storms for Series C and D are shown on pages 70 and 71.