



Updates to NOAA Atlas 14 Precipitation Depth-Duration-Frequency (DDF) Curves



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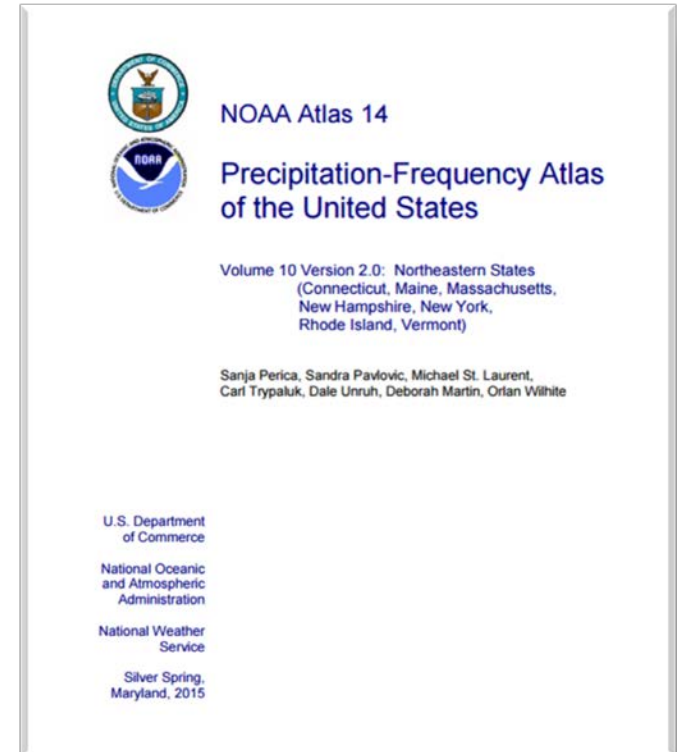
TOPICS

❑ Current status

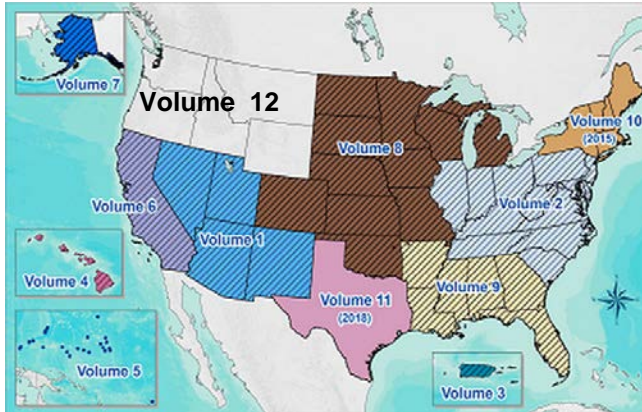
- Completion of “traditional” NOAA Atlas 14

❑ Proposed enhancements

- Funding approach
- Accounting for non-stationarity climate
- Accounting for uncertainties in estimates
- Conversion from point to areal precipitation frequency estimates

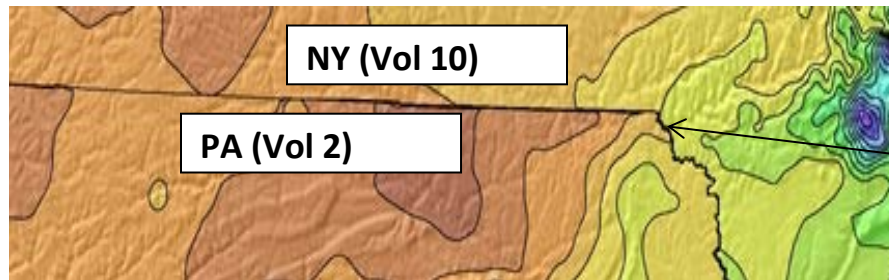


- ❑ Funding: work performed at request of users and funded by users



- ❑ Vol 1 (2004); data up to 2001
- ❑ Vol 11 (2018); data up to 2017 (+16 years)
- ❑ Vol 12 for remaining 5 NW states (funding not secured yet). Latest updates from 1964 & 1973.

- ❑ Approach causes inconsistencies at boundaries of adjacent volumes



100-yr 24-hr estimate (inches):
4.4 (Vol 2) vs 7.1 (Vol 10)

Need to secure funding to update estimates for the whole contiguous US simultaneously!

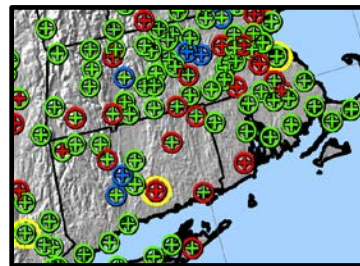
Accounting for non-stationary climate. Testing NA14 assumption of stationary AMS

□ NA14 TESTS

At gauged locations.

Applying parametric and non-parametric tests for trends in AMS mean and variance

positive trend
negative trend
no trend



Regional.

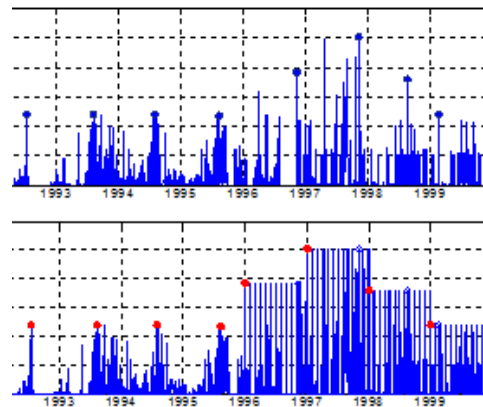
Testing H0: no serial correlation at 5% level in normalized AMS regressed against time



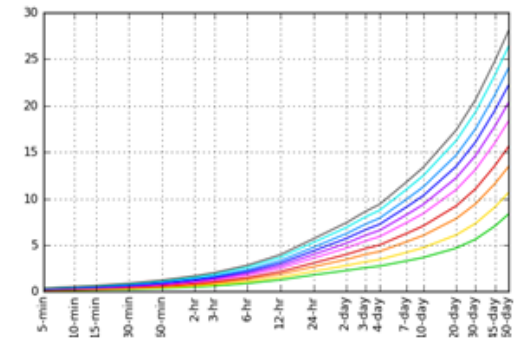
No spatially consistent trends in AMS data in Vols 1 -10, but could it be the data?

□ AMS vs PDS

- AMS-based analysis not sensitive to change in **frequency** of heavy events.
- Replace AMS with PDS?



No difference in AMS



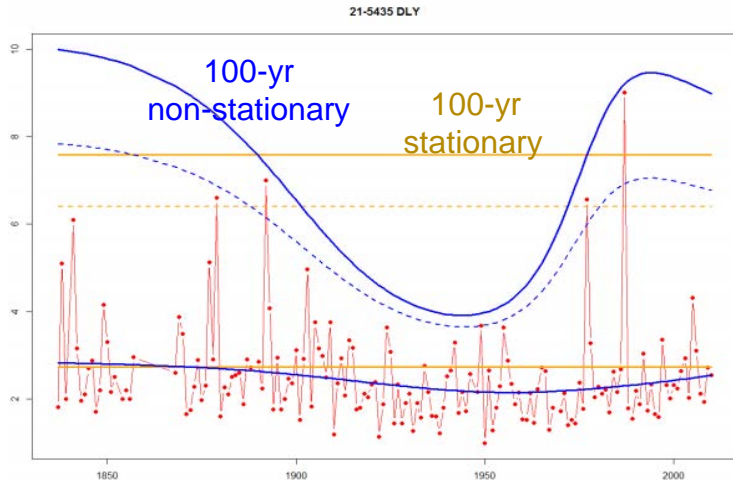
No difference in DDF

Accounting for non-stationary climate. Preliminary findings, unresolved questions

METHODOLOGY CHANGE

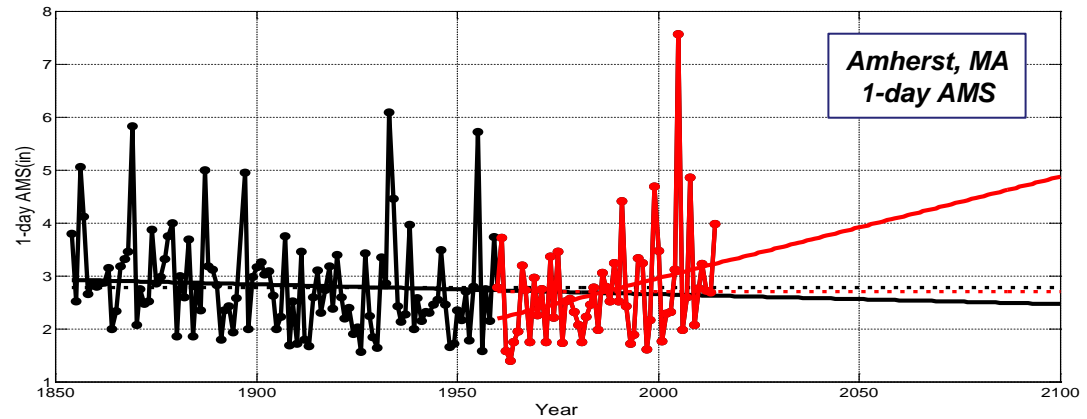
LMOM (in)	MLE (in)	MLE(t) (in)	LMOM vs MLE % change	MLE(t) vs MLE %change
15.0	20.0	20.7	33%	4%

SELECTION OF NON-STATIONARY MODEL



CHOICE OF PERIOD OF RECORD & DESIGN LIFETIME

- What period of record to use in the analysis?
- How much extrapolation to account for design lifetime?



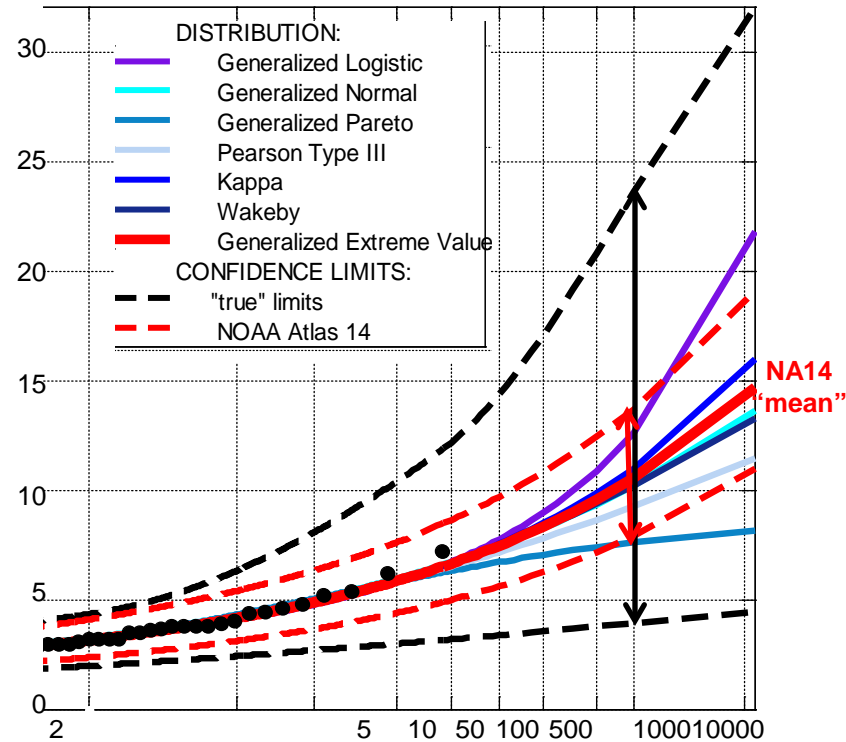
INCORPORATING CLIMATE PROJECTIONS

- Need to develop scientifically defensible methods
- Could this product provide useful information about extreme precipitation at spatial (point) and temporal scales of interest (sub-daily)?

Need to ensure we are not doing more harm than good!

□ NA14 CONFIDENCE INTERVALS

- Many users consider only “mean values” and don’t consider uncertainties.
- NA14 does take into account many factors: degree of confidence, sample size, exceedance probability, spatial correlation, ...
- NA14 does not account for all uncertainties: distribution selection, parameterization method, ... → NA14 confidence intervals underestimate the “true” confidence intervals.



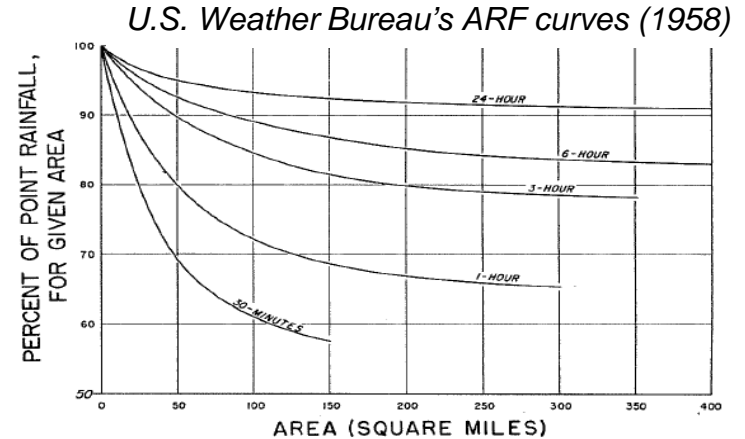
SHOULD WE EXTRAPOLATE ESTIMATES BEYOND 200-YR (500-YR) USING NA14 METHODS?

NO, BUT...

- In mid-2000 HDSC considered not publishing estimates above 200-yr; solicited opinions from users
- Users’ responses summarized here: http://hdsc.nws.noaa.gov/hdsc/pfds/docs/1000-yr_responses.pdf
- Some users routinely extrapolate NA14 estimates up to 10,000-yr ARI or more

□ AREAL REDUCTION FACTOR (ARF) CURVES

- NA14 estimates are point estimates representative only for a limited area around the point.
- NA14 estimates cannot be used directly in many applications that require areal estimates.
- ARF used to convert point precipitation to average precipitation over an area.
- Many ARF methods proposed, but engineers still use WB curves from 1958.



□ WORK STATUS

- HDSC has investigated differences among ARFs derived from common ARF methods and selected 2 methods suitable for NA14
- Peer review was planned before developing regional ARF curves for NA14 coverage area.
- Due to lack of funding for this project, all activities were put on hold during OHD/NWC reorganization.