Alaska Precipitation Extreme Value Analysis

using L-Moments

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June 19, 2019

Outline

1. Layout of Current Processing Workflow

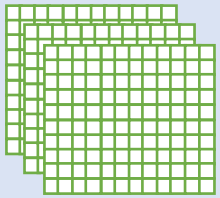
2. Example Graphics of Fairbanks International Airport generated using the processing workflow

3. Questions in relation to the NOAA Atlas 14

How we are performing our processing currently

Operates on single profile through time

Input Data



WRF Downscaled
Precip hourly totals
(ERA- Interim)

Pre-process

Compute Daily Precip Totals → Compute Duration Totals → Compute Annual Max Series (AMS)

Analyze

Fit to distributions using L-moments → Pull values at Intervals from fitted distrib's → Select distribution: K-S test / A-D test →

Randomly Sample Distribution → Fit Sample to Distribution → Pull Values at Intervals from Fitted Distribution

Bootstrap 500x → Estimate 5th/95th Bounds

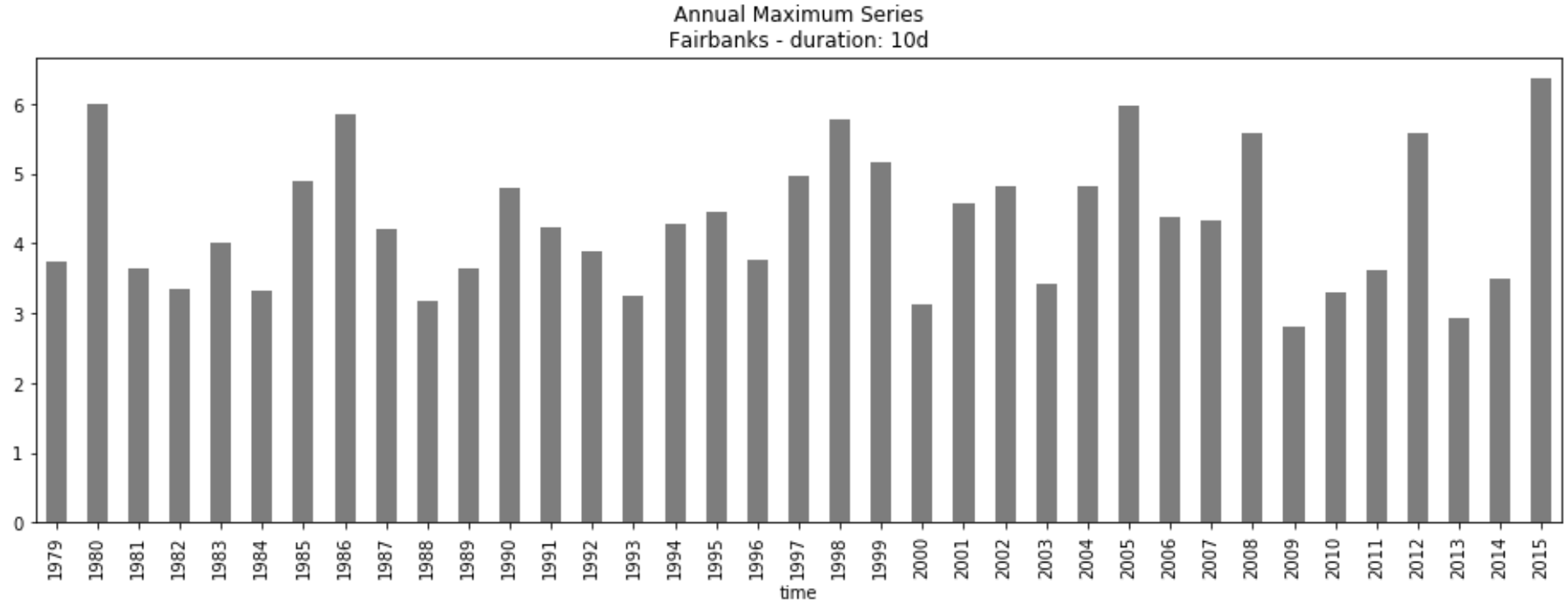
Confidence estimation Method:
The percentile interval method simply returns the 100*alphath bootstrap sample's values for the statistic.

Example Graphics

Fairbanks International Airport (20km pixel)

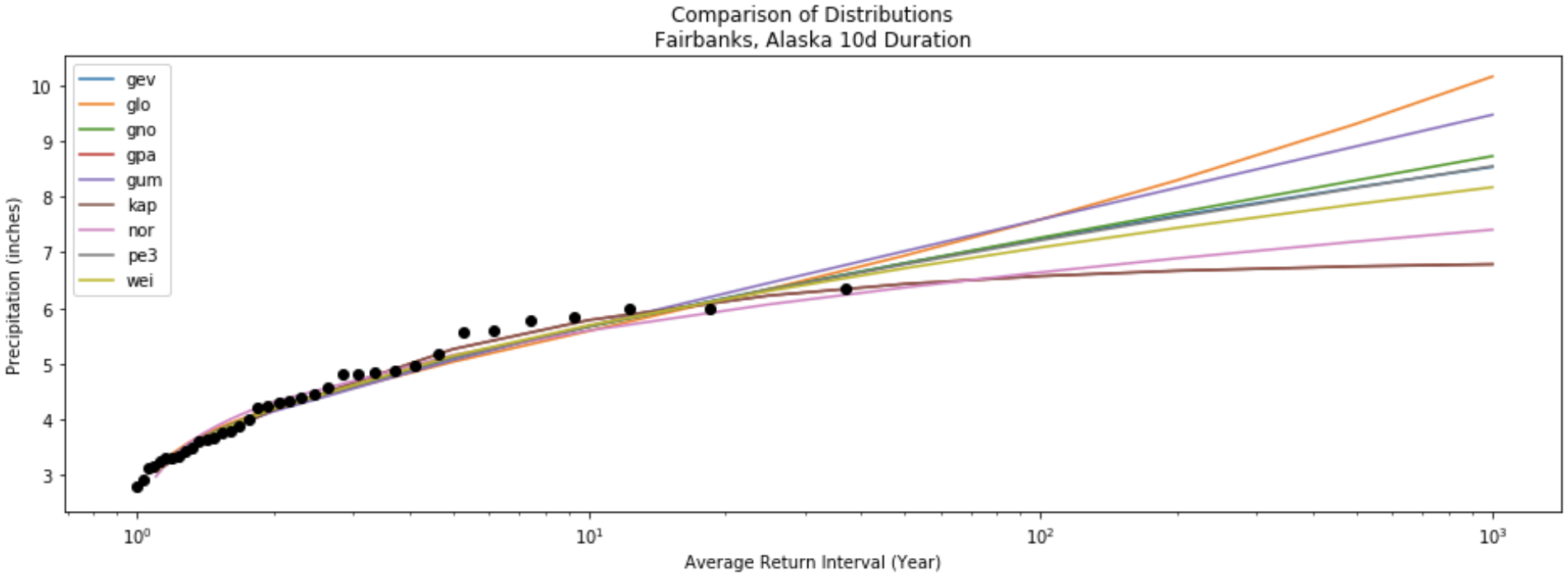
10-day Duration Period

A look at the Computed Annual Maximum Series (AMS)



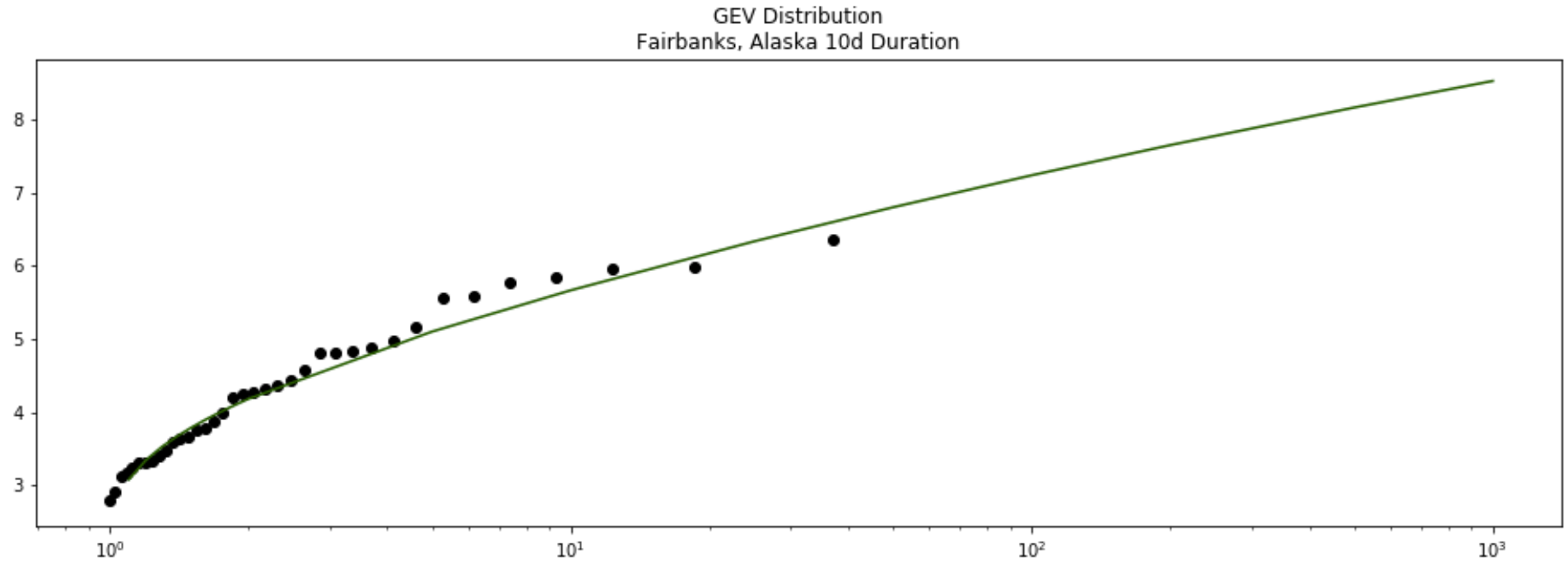
Fitted Curves from Multiple Extreme Value Distributions

with AMS values overlaid



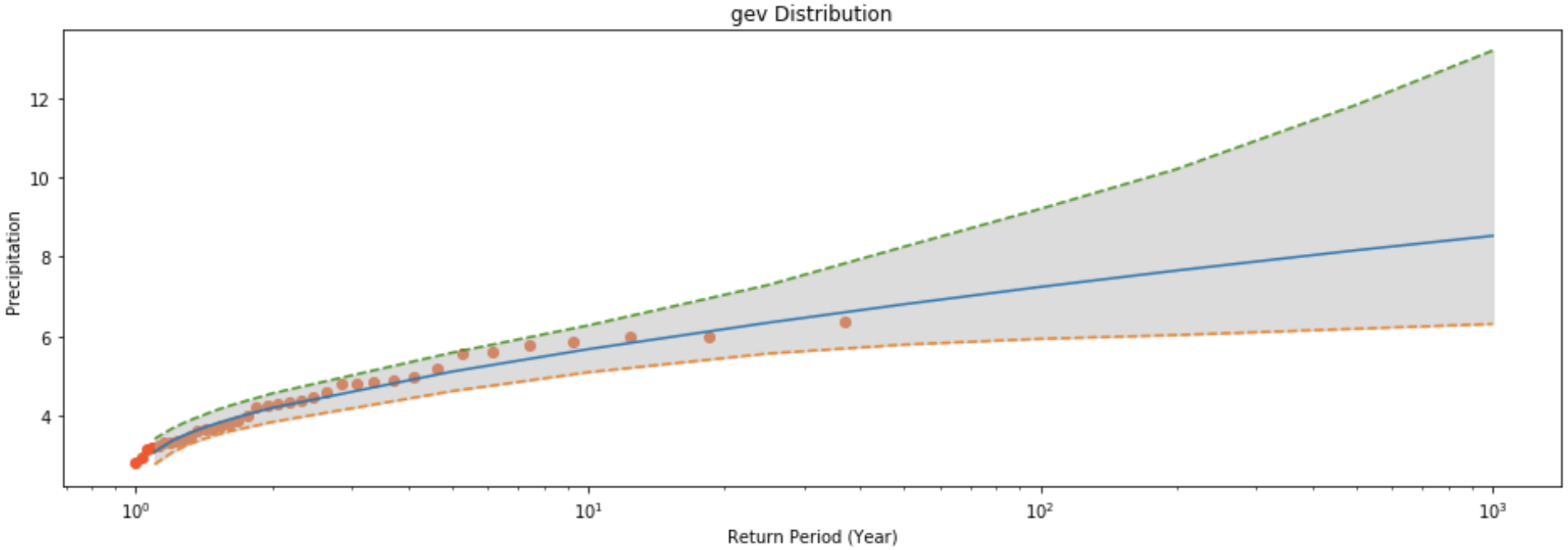
GEV Distribution Values at Selected Return Intervals

with AMS values overlaid



GEV Distribution Values at Selected Return Intervals

with Confidence Bounds and AMS values overlaid



Regional L-Moments

- Were the regional l-moments computed for every station? Meaning that every station would be a combination of its 10 closest neighbors?
  - If so, do you think that a simple distance metric would be useful with the regularly gridded reanalysis data we are using for this extension of Atlas 14?

- Our work is intended to extend the Atlas 14 using more recent data and examining future change scenarios, therefore, my thoughts have been to follow similar methods as were employed in building the Atlas, do you think this would be a proper way forward so as to have the most apples-to-apples comparisons as is possible?
  - We are examining multiple distributions as a way for us to examine the variability in the ERA-Interim Downscaled Reanalysis data used in this work, but are currently leaning towards the GEV distribution as that was used in the Atlas and usually shakes out near the top of the list of fit performance. Do you have any suggestions as to this approach?

Sub-hourly Data

- In the Atlas 14 scaling factors were developed that allowed for disaggregation to sub-hourly time-steps. These were computed using a small subset of stations that recorded values at finer time-steps from the NCDC.
  - Do you think that these scaling factors for sub-hourly would (should) be used if we were to provide data at these intervals?
  - Or are these values that should be developed in some way from the reanalysis products for consistency with the data being used?
    - We have been leaning toward using the scaling factors from the Atlas to disaggregate these data for comparison with the Atlas values.

Questions

Confidence Bounds

- Is the bootstrapping procedure laid out in an earlier slide capturing the kind of processing performed for the Atlas 14?
  - There appear to be multiple dimensions we could work on when performing this sort of estimation.
    - bootstrap the data itself through random selections from the 'best-fit' distribution, returning N-samples of possible values and using that larger sample to estimate bounds.
    - Or (potentially) operate on the l-moment ratios, as in estimate and return those for each randomized sample, then fit a curve to some aggregation of those ratios?
  - Do either technique laid out above follow what was done in Atlas 14?

- Do you have any code or other technical resources that delve more deeply into this process?

Processing Notes

Available Distributions
Exponential
Gamma
Generalised Extreme Value
Generalised Logistic
Generalised Normal
Generalised Pareto
Gumbel
Kappa
Normal
Pearson III
Wakeby
Weibull

Return Intervals
2
5
10
25
50
100
200
500
1000