Alaska Precipitation Extreme Value Analysis

using L-Moments

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June 19, 2019

Outline

1. Layout of Current Processing Workflow

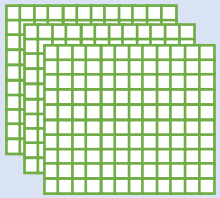
2. Example Graphics of Fairbanks International Airport generated using the processing workflow

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)
20km resolution

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

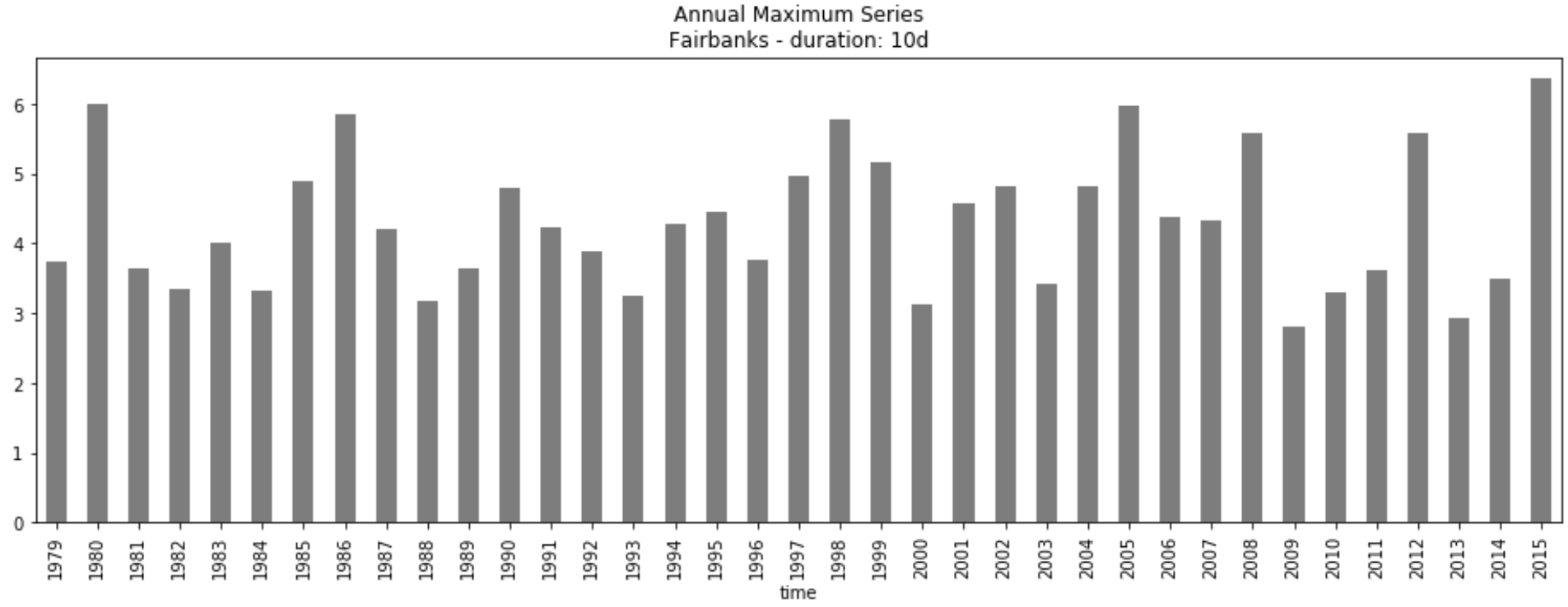
Confidence estimation Method:
The percentile interval method simply returns the 100*alphath bootstrap sample's values for the statistic.

Example Graphics

Fairbanks International Airport (20km pixel)

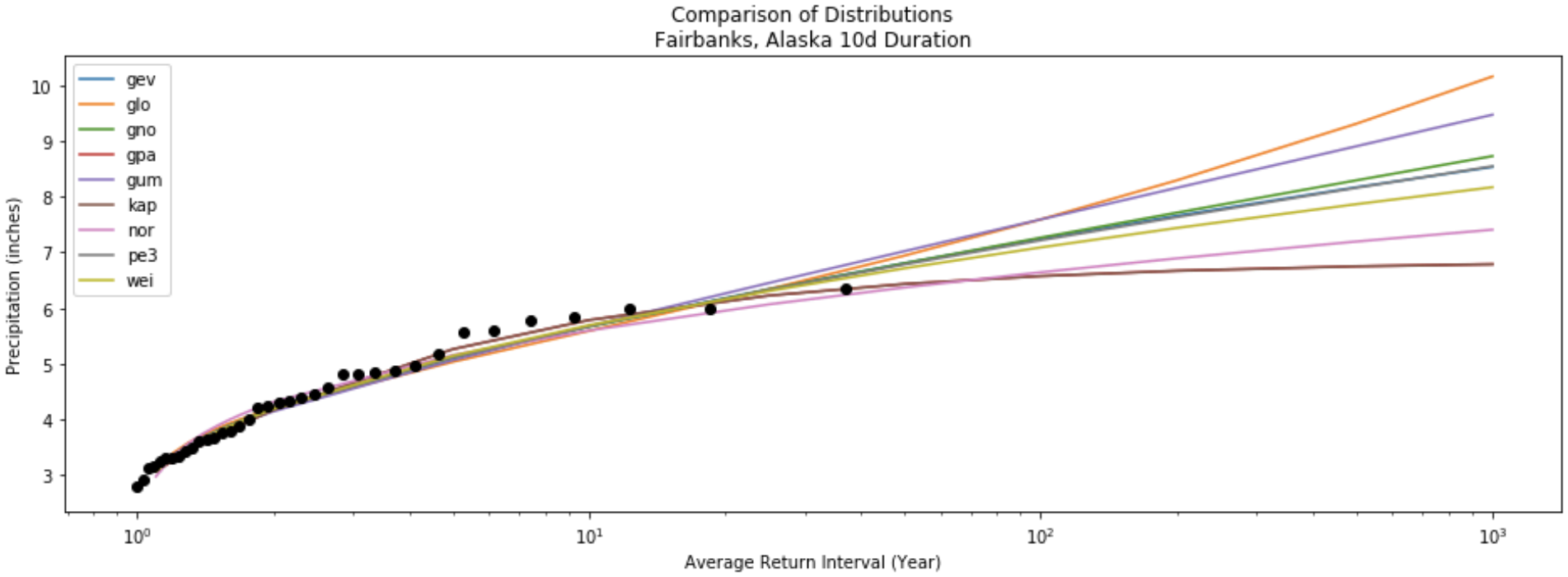
10-day Duration Period

A look at the Computed Annual Maximum Series (AMS)



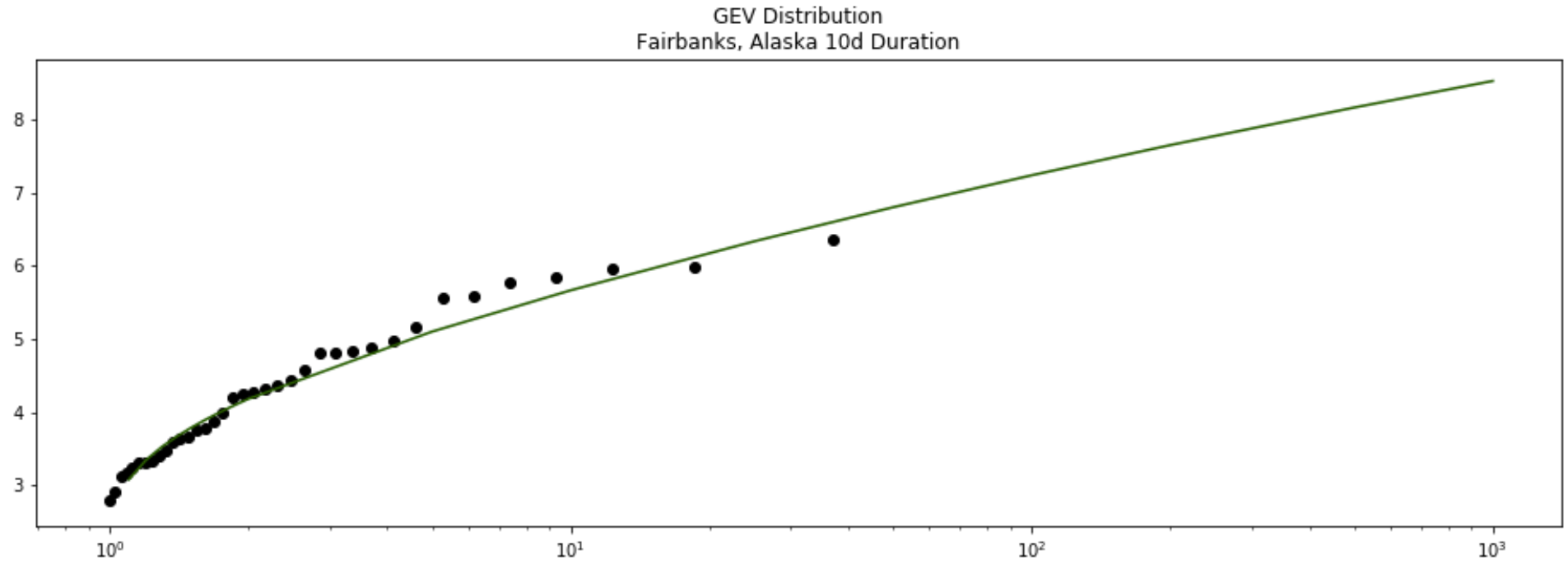
Fitted Curves from Multiple Extreme Value Distributions

with AMS values overlaid



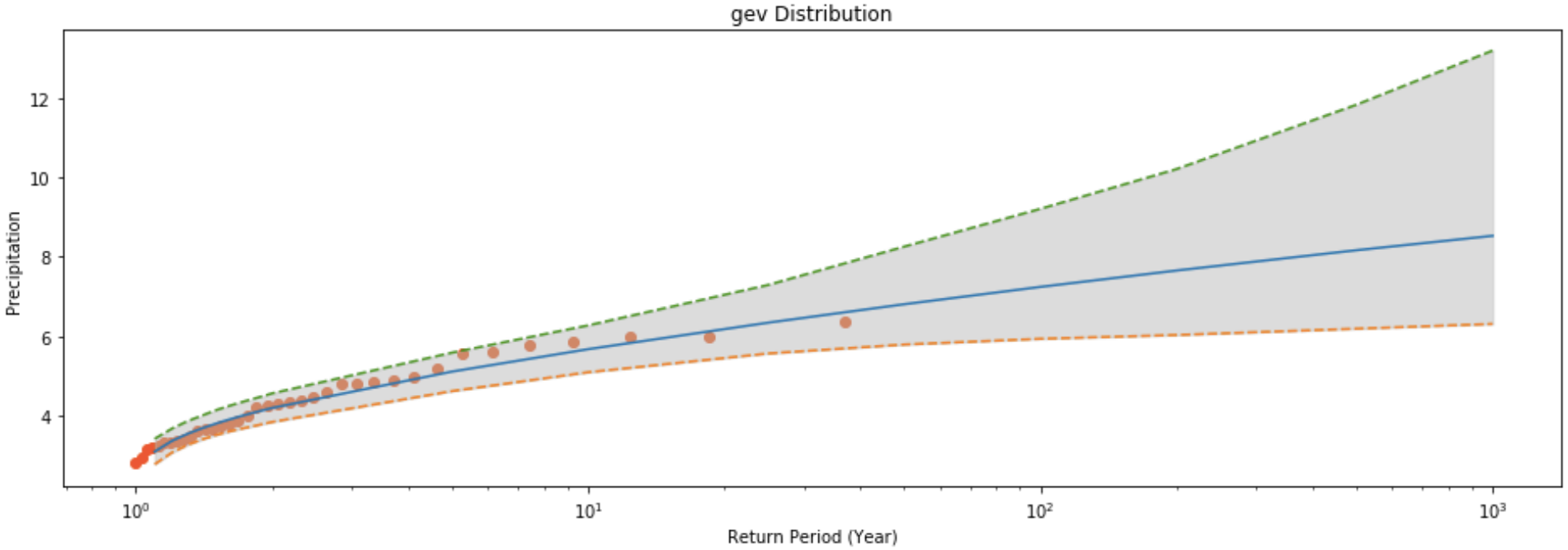
GEV Distribution Values at Selected Return Intervals

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 intending to extend the Atlas 14 using more recent and future prediction data, therefore, our 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 extreme value distributions using a dynamically downscaled reanalysis dataset, which has shown that the distributions don't vary too much in the test locations we have selected. Therefore, we are currently leaning towards the Generalized Extreme Value (GEV) distribution based on its use in the Atlas and it usually ends up near the top of the list of fit performance metrics.
    - Does this sound logical, or do you have any suggestions as to improve or alter this approach?

Sub-hourly Data

- Do you think that the scaling factors for sub-hourly durations would (should) be used in this effort if we were to provide data at these short time intervals?
  - In the Atlas 14 report it indicates scaling factors were developed using a small subset of stations that recorded values at finer time-steps from the NCDC. We were curious as to what you knew about these values and whether they may translate to other similar work (such as this current work).

- Or should these values be derived in some way using 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.

Confidence Bounds

- Is the bootstrapping procedure laid out in an earlier slide similar to the processing performed for the Atlas 14?
  - We have implemented a bootstrap procedure where random selections from the 'best-fit' distribution are generated, returning 500 sample profiles which can be used to estimate simple bounds.
    - Does this sound like the Monte Carlo procedure used in Atlas 14?
    - If this is incorrect, do you know of a technical resource that lays that procedure out more clearly than Hosking and Wallis 1997? They touch on it, but don't really lay out explicitly (that I have seen) how it was done.

- Do you have any code or other technical resources that delve more deeply into this process?
  - When discussing your project with one of the Atlas 14 collaborators, Sveta Stuefer, they indicated that a Matlab program was used to perform much of the computation, so we were curious if that was published and we could use that to guide our work.

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