Automating Peak-over-Threshold with the Information Matrix Test

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Outline

• Task
• Information Matrix Test → what does it test?
• Algorithm → how do we use it?
• Applications → daily, hourly precipitation
Task

warnings

media

MeteoSwiss

insurance business

engineering
Task

Precipitation

- 10-minute gust max
- Max daily mean

Fresh snow

- 1-day, 2-day, 3-day, 4-day, 5-day sums
- Max/min daily mean, max daily max, min daily min

Wind

- 10-minute gust max
- Max daily mean
Task

max/year  Block Maxima

Gen. Extreme Value Distr. (GEV)

Peak-over-Threshold

Gen. Pareto Distr. (GPD)

use Information Matrix Test to select
• threshold
• run parameter
Information Matrix Test

Summer daily precipitation
Chateau d'Oex

time

daily precipitation
Information Matrix Test

GPD

threshold

time

Sophie Fukutome
ESF-COST 2010
Information Matrix Test

GPD

threshold

Poisson
Information Matrix Test

run parameter:
min. distance between independent events

select
• threshold

run parameter

with best model
of inter-cluster times
Süveges & Davison, 2010

IMT > 3.84: poor fit
IMT < 3.84: acceptable fit
IMT \approx 0: best fit
Algorithm
Algorithm

more obs

less obs

IMT < 0.05
Algorithm

more obs

less obs

IMT < 0.05
Algorithm

Summer daily precipitation
Chateau d’Oex

30y return level

shape

mean exceedance

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Algorithm

Summer daily precipitation
Geneva

Shape
Mean exceedance

30y return level
Threshold

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Algorithm

Summer daily precipitation
Locarno

30y return level

mean exceedance

shape

threshold

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Applications: hourly precipitation
Engelberg: Summer
Applications: daily precipitation
30-year return levels

Summer

Winter
Applications: hourly precipitation
30-year return levels
Conclusions

Summary
• The Information Matrix Test can be used to select threshold and run parameter automatically
  • selected thresholds gen. compatible with classical diagnostics
  • results agree with climatology
• More objective selection based on theoretical criteria

Outlook
• Other aggregations, other parameters
• Improve algorithm

Thank you!...