

Zentralanstalt für Meteorologie und Geodynamik 

EVA – An Interactive Online Tool for Extreme Value Analysis

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The EVA System

Examples

Developments and ideas for improvement

Summary





Extreme Value Analysis tries to **extrapolate to extreme** events that have not yet been observed by statistically analysing the structure of **observed extreme** events (asymptotic fit).

Results change each time a new extreme event occurs.

Technical and logistical effort!

- Easy to access and use.
- Responds quickly to data request.
- Provides information for the forecasters, climatologists and external experts (hydrology and engineering, ...).
- Combines various approaches to Extreme Value Analysis.
- Works on historical data and includes most recent data.
- Include data from METEORISK (Interreg 3b) partners in the alpine region.





met. database

```
11801;19170101;414;  
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extract all
annual maximum
values

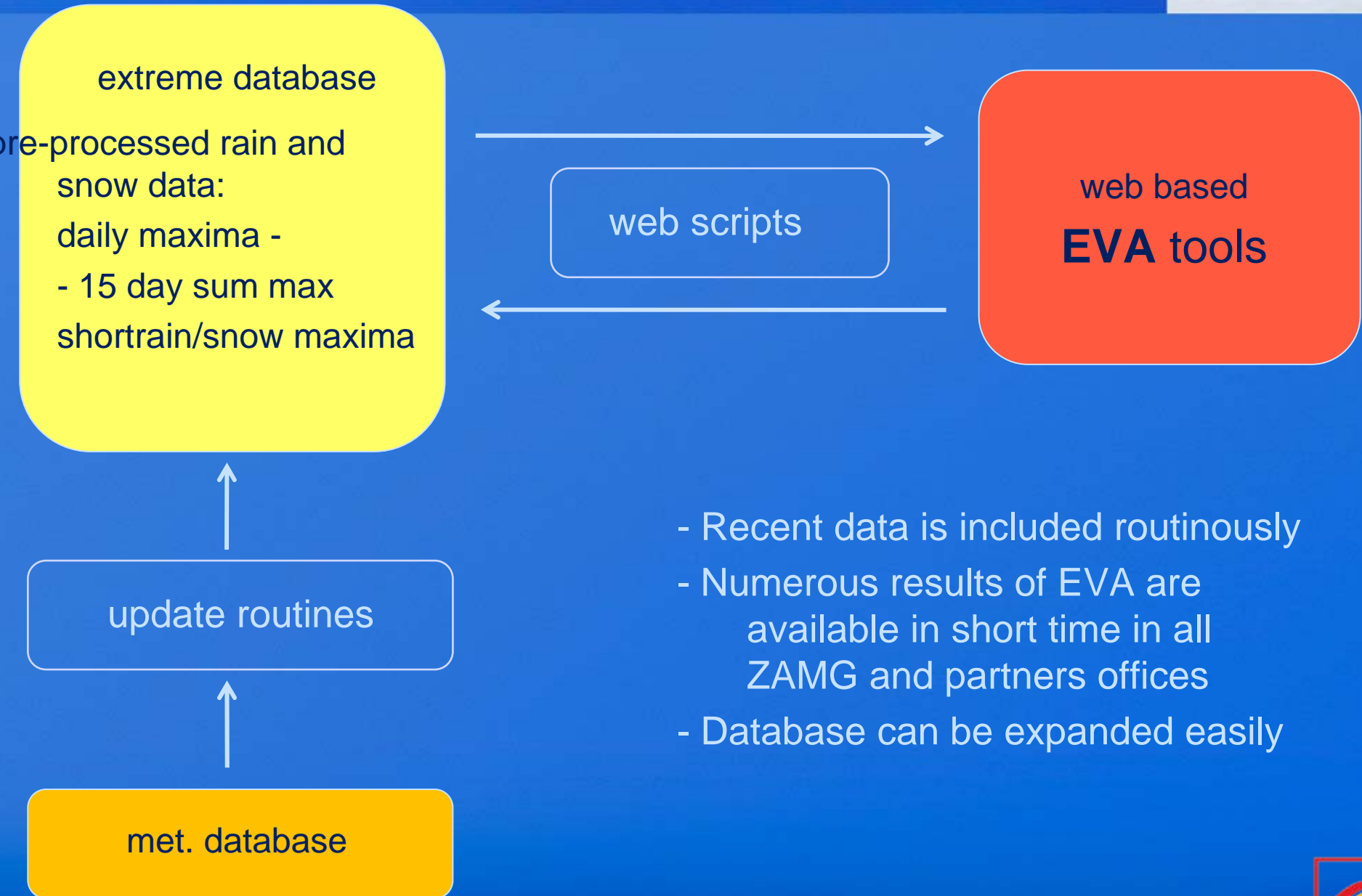
extract all
annual maximum
values of a sliding
sum up to XX days

...

Extreme Value
Analysis

...quite some steps to go ...







Diagnostic Plots -- Meteorisk Extreme Value Analysis - Please select

Region?	TIROL	Parameter?	shortrain
Station?	5031140 - ACHENKIRCH (FL)	Distribution?	GEV
Interval?	1 Days	Timescale?	all data
Period?	Year	Missing?	0 %
Output?	plots and tables	Additional Value?	

SHOW DIAGNOSTIC PLOTS

HOME

- Fast Tool
- Diagnostic Plots
- Sub Data Set Plots
- Winter Progress
- Monthly Sums
- Yearly Sums
- Precipitation Intensity
- Report Tool
- Charts
- Data Overview
- Analysis
- Documentation
- Team / Contact

Parameter and data selection

Tools to select



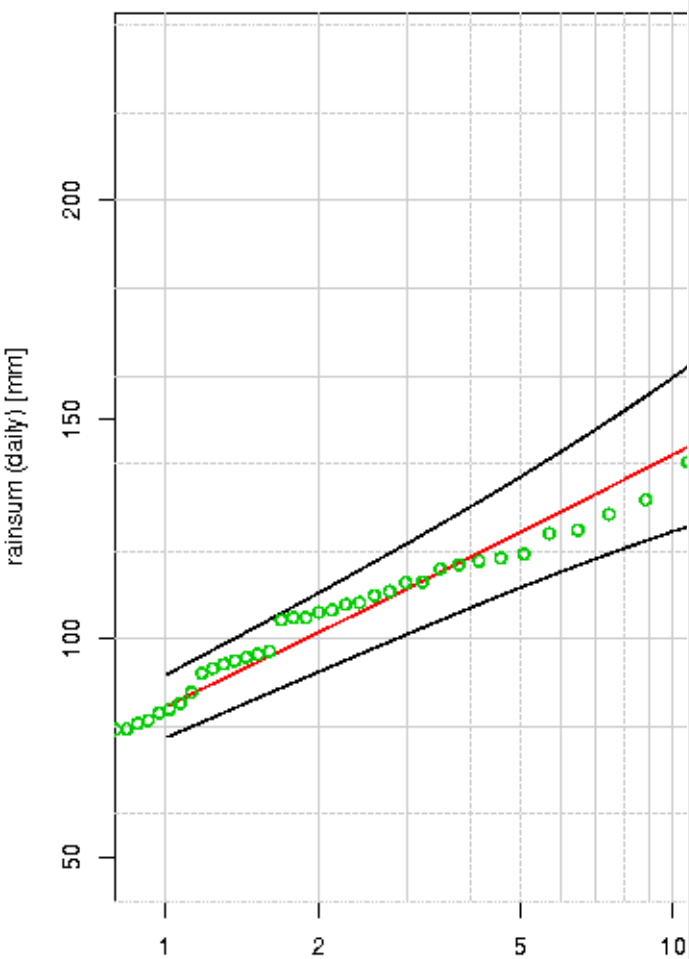
STATION INFO

RETURN TIMES

TAG	INFO	T [Years]	rain
Station Name	ACHENKIRCH (FLIRI)	1.1	165.9 mm
Station Number	5031140	1.2	168.6 mm
Original Station Number	5031_101345	1.3	171.1 mm
Region	TIROL	1.4	173.3 mm
Station Height [m]	920	1.5	175.5 mm
Latitude	47.5333	2	184.3 mm
Longitude	11.7	3	196.7 mm
Station Owner	HD T	4	205.5 mm
Station Owner Long Name	AMT DER TIROLER LANDESREGIERUNG - HYDROGRAPHIESCHER DIENST TIROL	5	212.2 mm
Selected Parameter	rain	6	217.7 mm
Selected Interval	15 Days	7	222.4 mm
Selected Period	Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec	8	226.4 mm
Selected Method of Estimation	MLE	9	230.0 mm
[Years] used from selected series	55	10	233.1 mm
[Years] missing from selected series	0	20	253.9 mm
[Year] Begin of selected series	1946	30	265.9 mm
[Year] End of selected Series	2000	50	281.0 mm
[Years] Total Length of Series	55	75	293.0 mm
[Year] Begin of Total Series	1946	100	301.4 mm
[Year] End of Total Series	2000	150	313.2 mm
Percentage of missing vals [%]	100	200	321.5 mm
Additional Value		300	333.3 mm

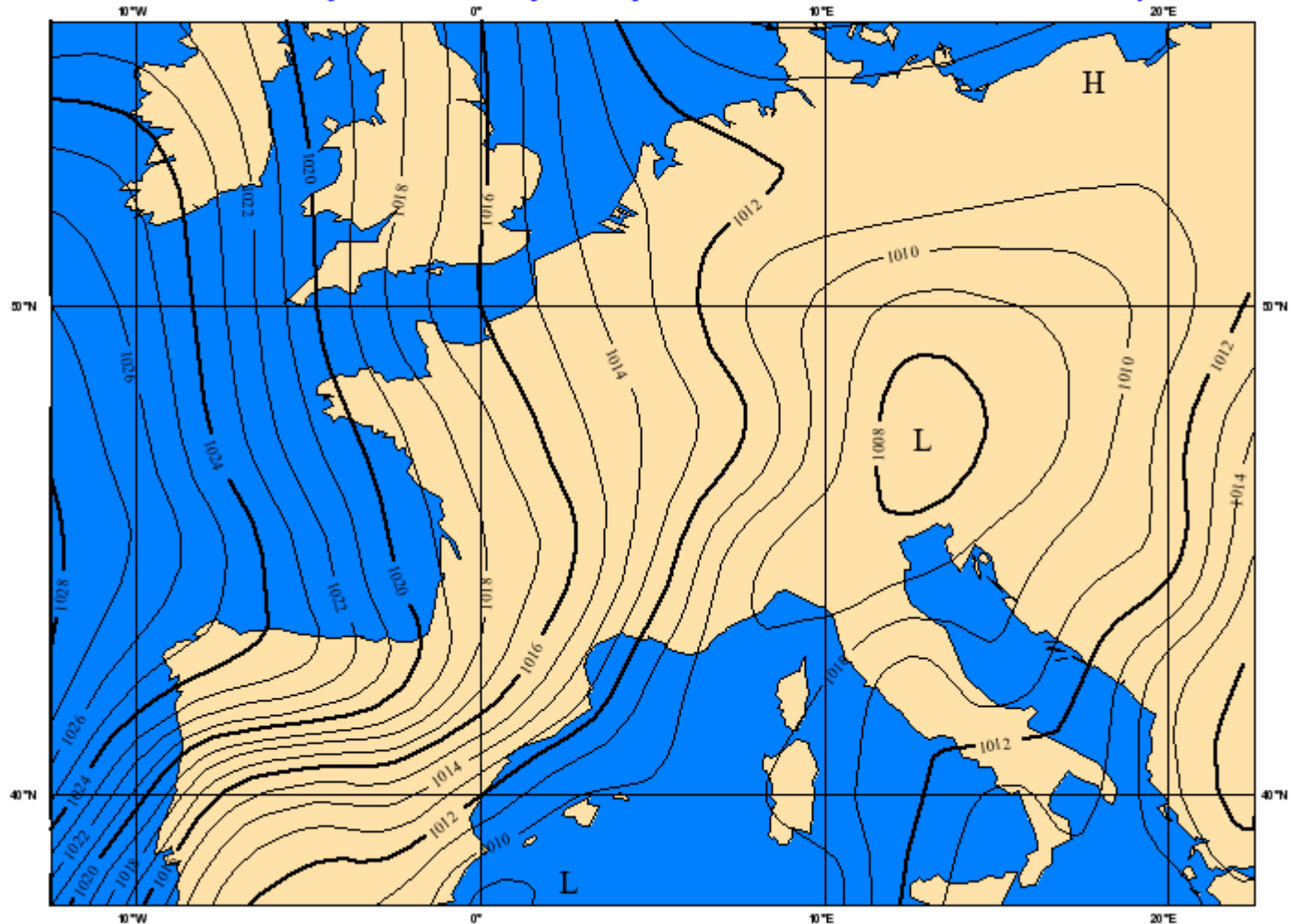


GEV Distribution – ACF



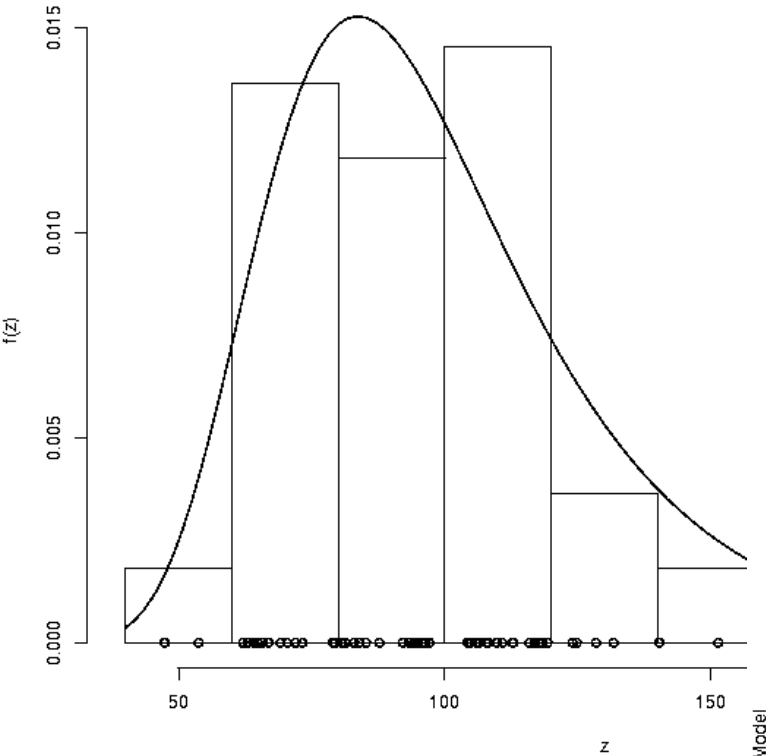
Rank	Date	Value [mm]	QUAL	Wetterlage Richtung
1	1981-07-17	215.3	31	CHART
2	1954-07-07	194.4	31	CHART
3	1985-08-05	160.4	31	CHART
4	1999-05-21	151.4	31	CHART
5	1990-02-13	140.3	28	CHART
6	1951-01-19	131.7	31	CHART
7	1961-12-11	128.4	31	CHART
8	1970-08-08	124.8	31	CHART
9	1964-11-16	124.0	30	CHART
10	1975-06-29	119.3	30	CHART
11	1995-08-27	118.4	31	CHART
12	1976-05-31	117.7	31	CHART
13	1946-07-05	116.8	31	CHART
14	1977-07-30	115.9	31	CHART
15	1957-02-23	112.9	28	CHART
16	1959-06-11	112.8	30	CHART
17	1997-07-06	110.8	31	CHART
18	1948-06-17	109.8	30	CHART
19	1973-11-14	108.2	30	CHART
20	1979-06-15	107.8	30	CHART
21	1992-07-31	106.5	31	CHART
22	1949-08-12	106.0	31	CHART
23	1996-07-08	104.8	31	CHART

ECMWF ERA-40 Analysis VT: Saturday 18 July 1981 06UTC Surface: mean sea level pressure



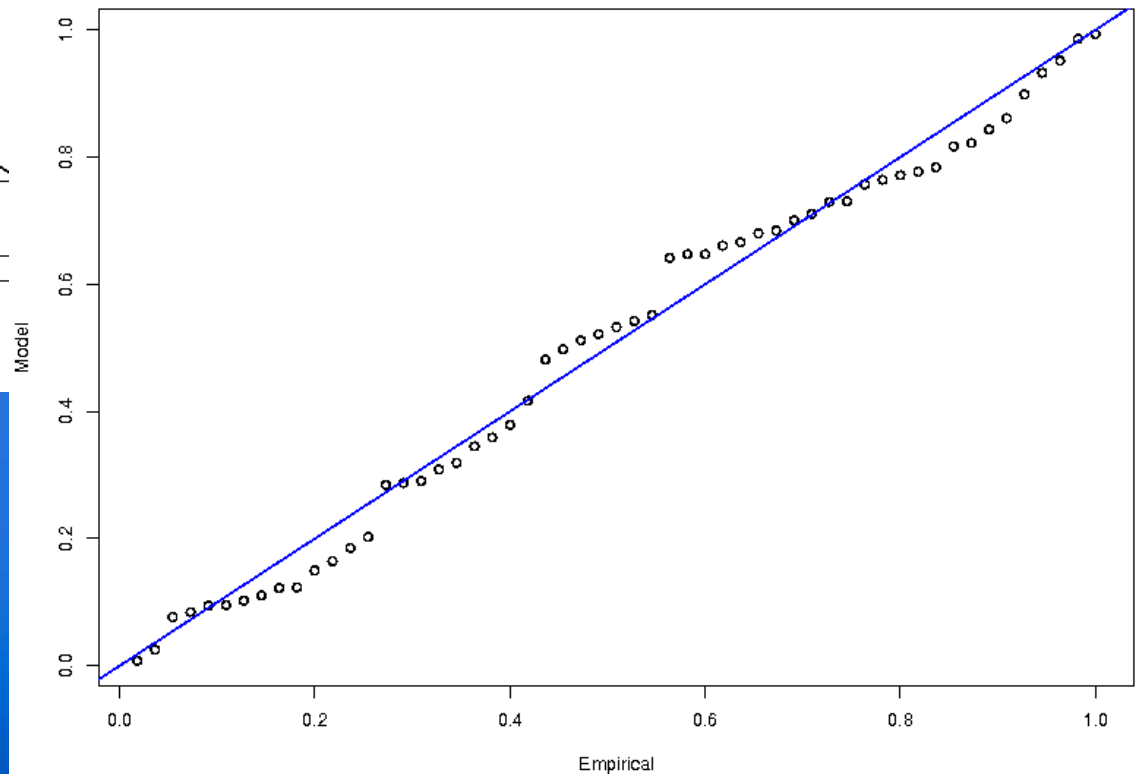


GEV Distribution - Density Plot - ACHENKIRCH (FLIRI) (920 m) - TIROL



Histograms of empirical and theoretical GEV distribution.

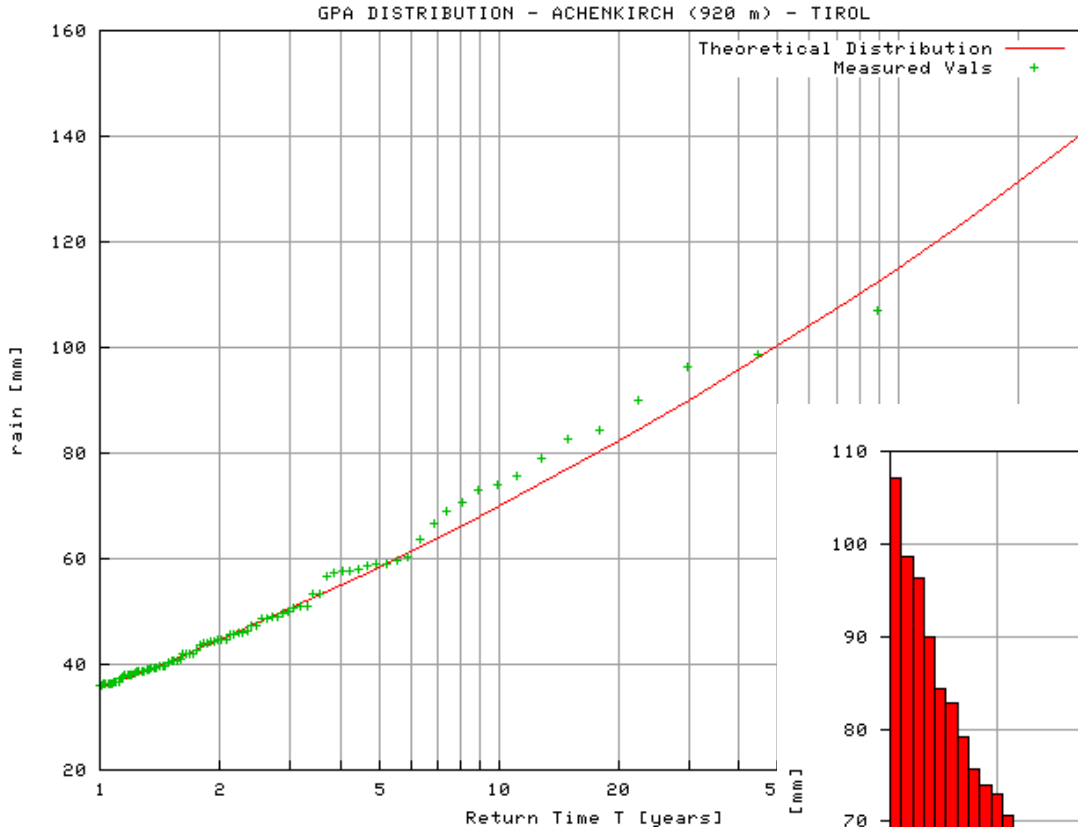
GEV Distribution - Probability Plot - ACHENKIRCH (FLIRI) (920 m) - TIROL



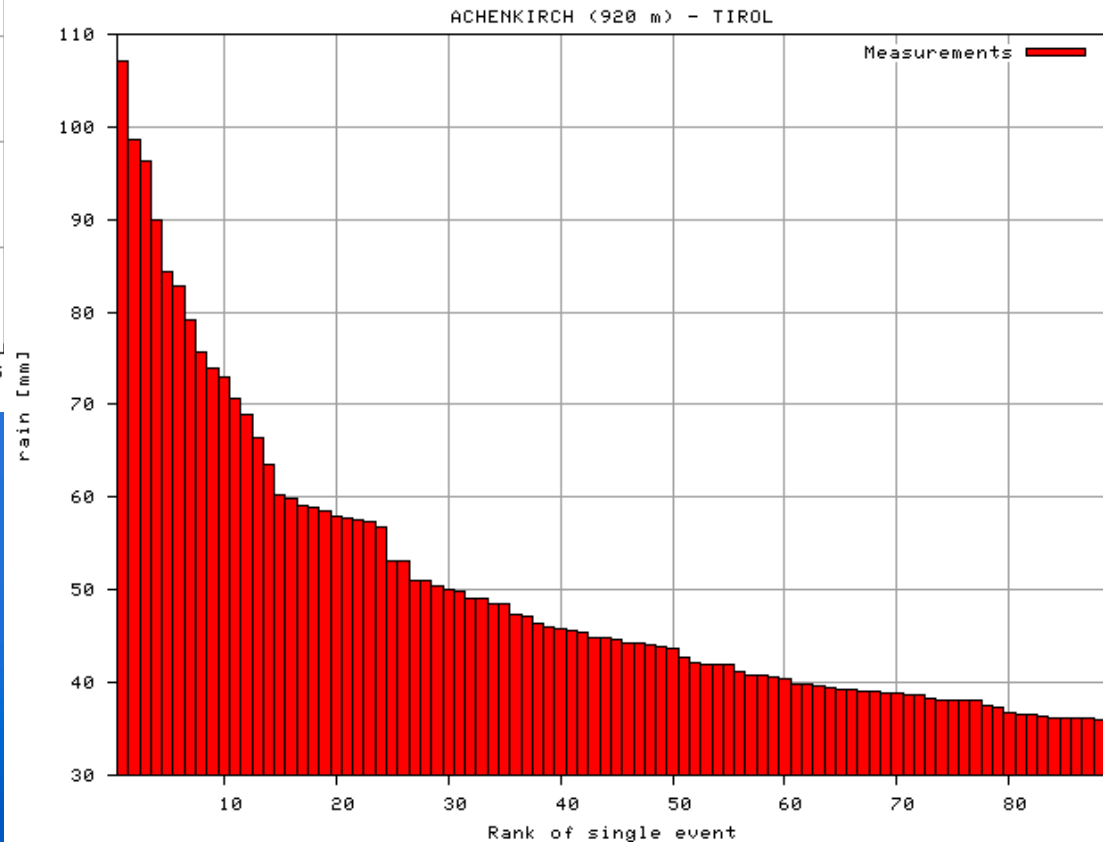
Comparing empirical and fitted distribution according to cumulative probabilities



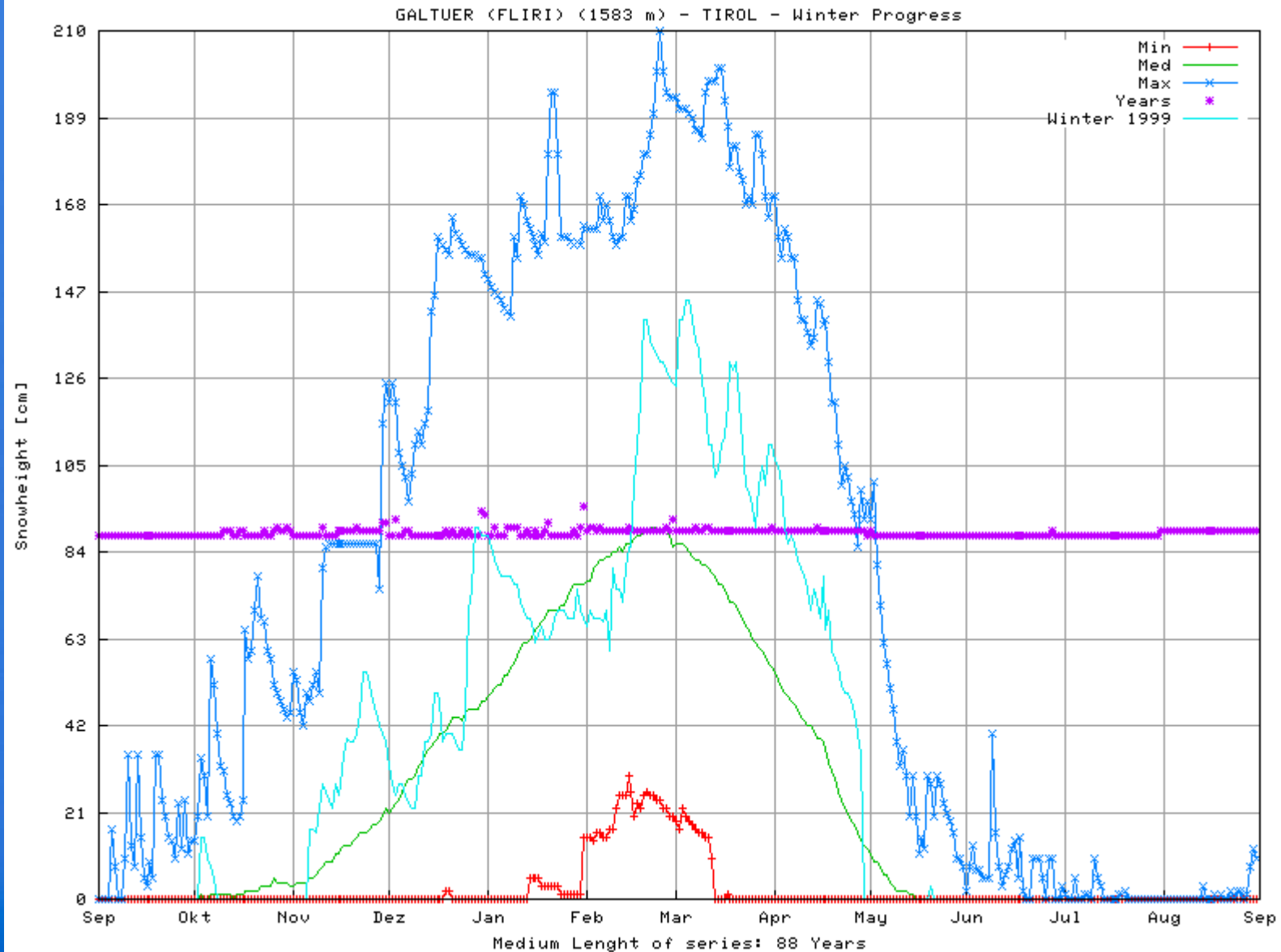
GPA distribution with L-moments method



Ranked daily sums of GPA distribution (peak over threshold)



Example winter progress





1) EVA for 10 min - yearly sums of rain and snow

2) EVA for 10 min mean wind speed and gusts

3) EVA for max and min temperatures
+ smallest max & highest min

4) EVAMAPS:

Combining historical measurements and forecast data
Get a view about the spatial dimensions of an extreme
event



EVAMAPS

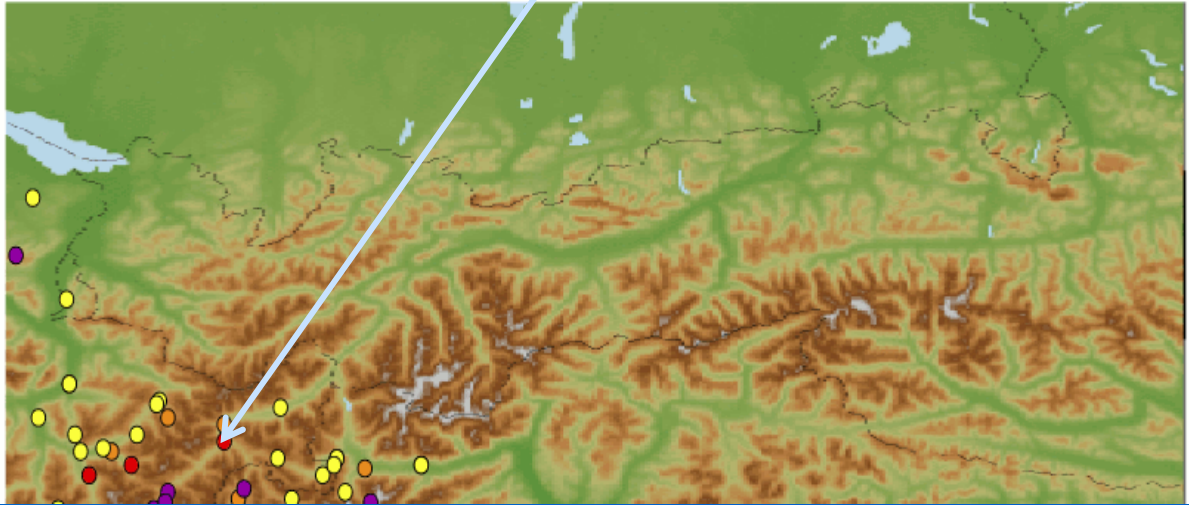
Parameter: hn	perfectprog	realistic	pessimistic	Parameter: rr	perfectprog	realistic	pessimistic	Parameter: rr	tawes
2008-09-13 06 UTC + 1d	0	0	0	2008-09-13 06 UTC + 1d	0	8	36	2008-09-13 11:15 UTC - 24h	0
2008-09-13 06 UTC + 2d	0	0	0	2008-09-13 06 UTC + 2d	0	1	32	2008-09-13 11:15 UTC - 48h	0
2008-09-13 06 UTC + 3d	0	0	0	2008-09-13 06 UTC + 3d	0	1	17	2008-09-13 11:15 UTC - 72h	0
2008-09-13 06 UTC + 4d	0	0	0	2008-09-13 06 UTC + 4d	0	0	7	2008-09-13 11:15 UTC - 96h	0
2008-09-13 06 UTC + 5d	0	0	0	2008-09-13 06 UTC + 5d	0	0	4	2008-09-13 11:15 UTC - 120h	0

Number of stations exceeding return period threshold

EVAMAPS - FORECAST
 RUN: ECMWF 20080912 12 UTC
 20080913 06 UTC - 20080914 06 UTC
 Parameter: rr
 Summe: 1 Tag(e)
 model: pessimistic, factor: 2.0

zugewiesene Jährlichkeit: **50 Jahre**
 Wert: 83.2mm
 Untergrenze: 50a/81mm
 Obergrenze: 100a/88mm

- 10 - 30 Jahre
- 30 - 50 Jahre
- 50 - 100 Jahre
- > 100 Jahre



Forecast / TAWES is mapped to closest Meteorisk station



Statistical tests for the data:

- Trend analysis and analysis of independence of events
- Analysis of homogeneity and stationarity
- Adding standard statistics

Methodical developments:

- Aggregation of stations within climatological regions
- EVA for weather type classification
- Importance of single stations within an extreme event or a region

Technical developments:

- Upload of single station file for just one session
- One single platform for all methods and data types





EVA

Is built on an effective database and a number of web-based tools that are easy to use and have quick response

Handles different methods for extreme value analysis

Is able to deal with different meteorological parameters

Is continuously developed and improved

Is used by a wide range people from bench forecasters to climatologists and external experts





THANKS!

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