Schweizerische Eidgenossenschaft
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Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

EUMETSAT
CM SAF
CLIMATE MONITORING

Meteorological Service Perspective on Near-Real-Time Climate Information

Reto Stöckli,
with a little help of CM SAF Friends and the MeteoSwiss Climate Service

Common statements of climatologists at NMHS's:

«We get customer requests on temperature, precipitation and sunshine duration. We can answer those with surface station measurements.»

«What do the acronyms TCDR or ICDR stand for?»

«When I search for satellite data at EUMETSAT, ESA or NASA I am totally lost. I have no chance to understand the diversity and complexity offered

Created by wordclouds.com with cmsaf.eu and esa-cloud-cci.org

Requirements on Fog / Clouds

Each autumn we get questions on fog occurence. We cannot answer them with station data alone.

- Could EUMETSAT or ESA produce a fog climatology over Europe in addition to total cloud cover? → From the ECV to an Climate Impact Variable

- We have to automate the synoptic cloud observation. Satellites could spatially extend point information from Ceilometers, Cloud Cameras and Pyrgeometers. → Integration of ground+space based observation networks needed instead of single sensor analyses

Requirements on Accessibility, Usability and Knowledge Transfer

- Where can climatologists online browse through gap-filled CM SAF or ESA CCI anomaly maps and interactively do regional analyses without downloading? → Potential for the European Weather Cloud as interactive analysis tool?

- We need a real person to interpret and apply the data. Could we buy «consultancy» from CM SAF or ESA CCI?
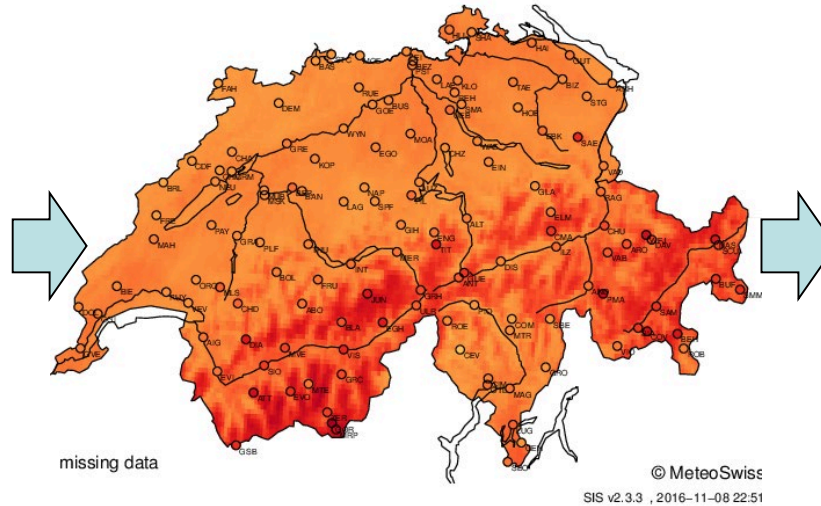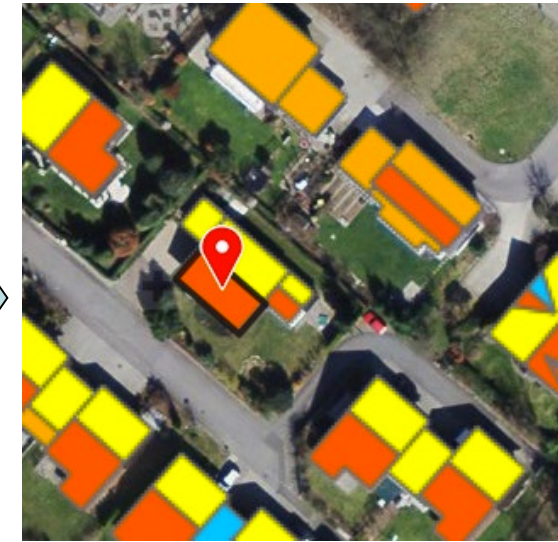 → A climate service is more than serving

The long path to the end user. Swiss National Climate Service Example
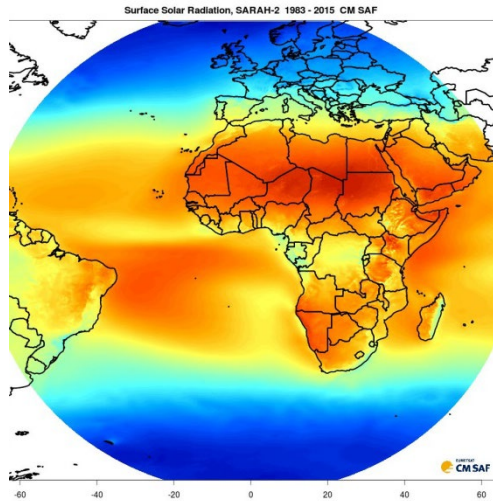
CM SAF SARAH

Heliomont: SIS in Terrain & over Snow


# of solar-heated showers

- 2002-2007: CM SAF Algorithm for Europe+Africa (EUMETSAT)
- 2007-2012: Extension for Alpine Terrain (MeteoSwiss)
- 2012-2017: Application for the end user (Government / Cantons)
- ➢ 60% of the path happens after the ECV production of the

www.sonnendach.ch

**Do not ask,
"which parameter do you need?",
but instead ask:
"what are you doing?"**

D. Bresch (2017)
Professor for Weather and Climate Risks
at ETH and MeteoSwiss

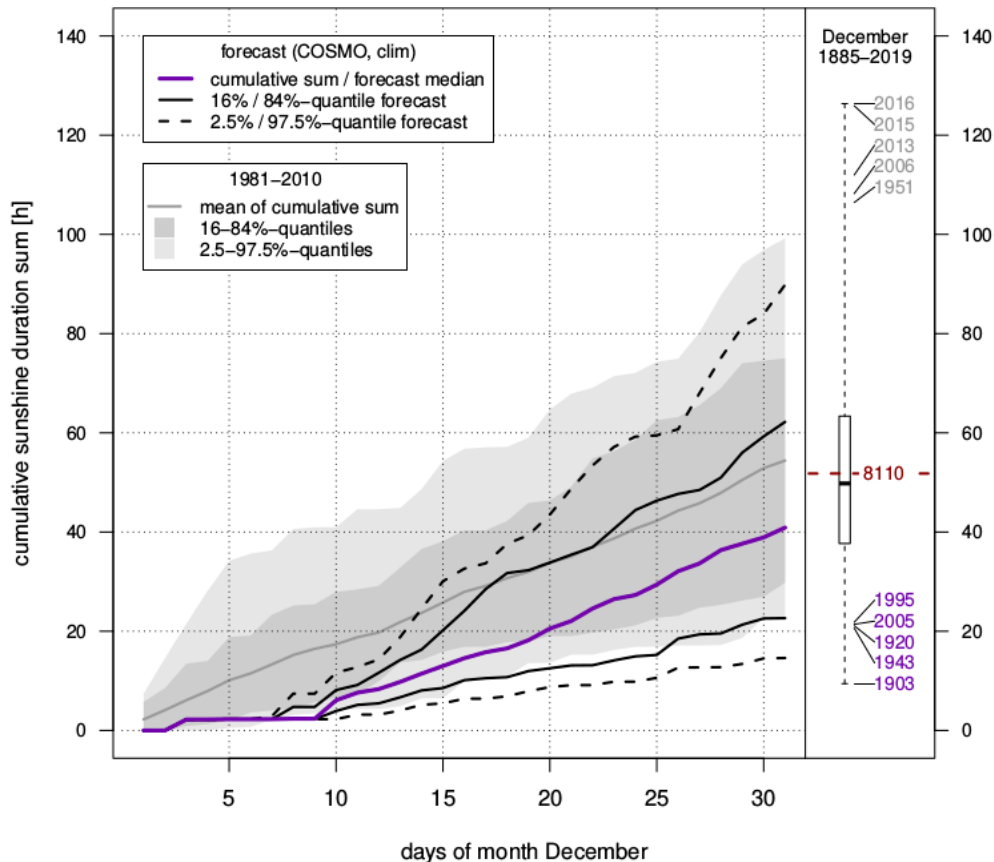# Uncontroversial Climate Datasets: Homogenized, Gap-Free since 1864.

Jahres–Temperatur – Schweiz – 1864–2020
Abweichung vom Durchschnitt 1871–1900
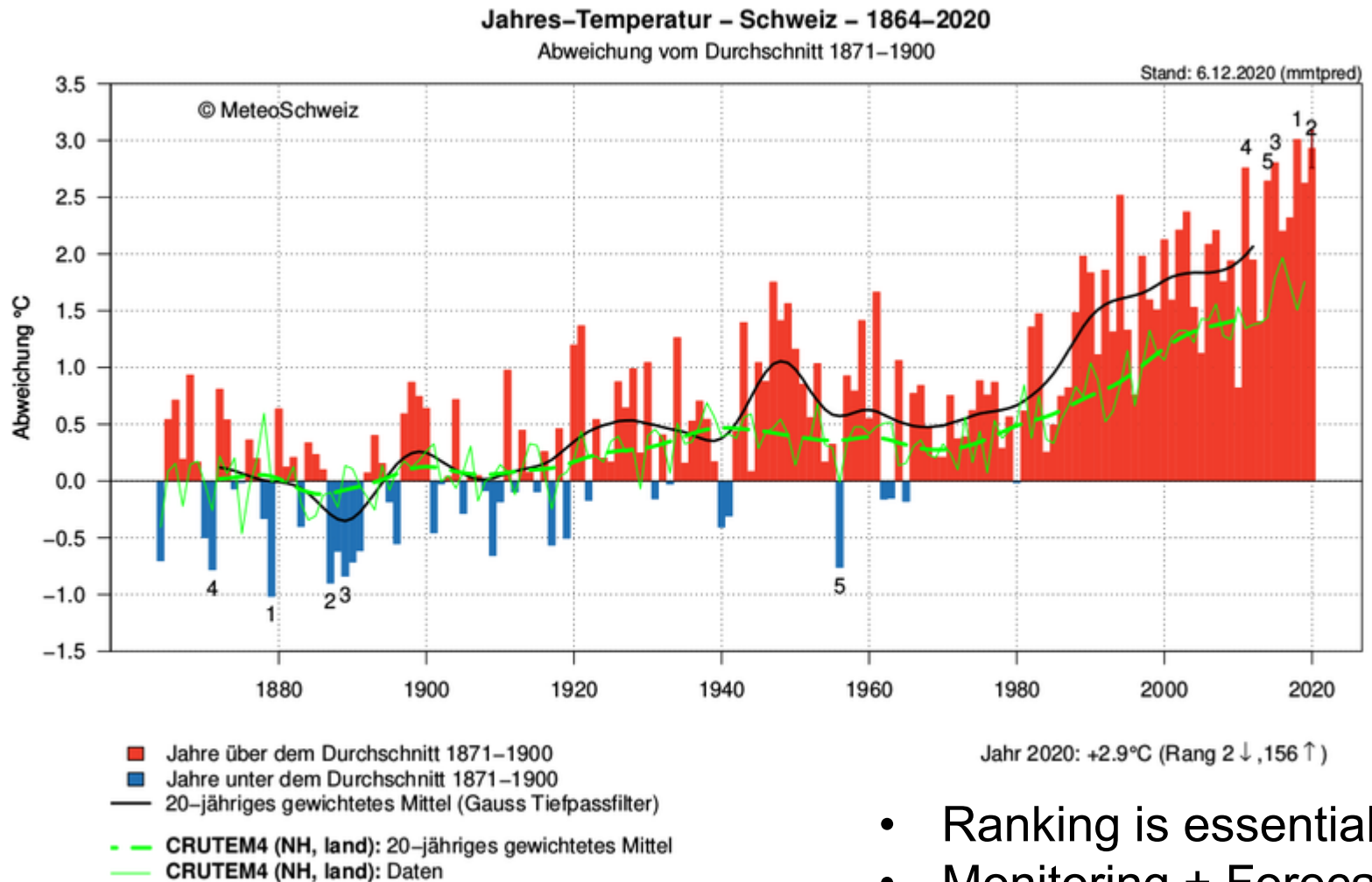
- Ranking is essential
- Monitoring + Forecast

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Monthly Outlook: Extrapolation and Ranking: Requirements from Media.

Monthly Sunshine Duration Sum Outlook
Basel / Binningen: December 2020

monthly ratio outlook

97.5% – q:	1.73	rank 129	
84% – q:	1.20	rank 98	
50% – q:	0.79	rank 44 (of 136)	
16% – q:	0.44	rank 7	
2.5% – q:	0.28	rank 2	

norm 1981–2010: 51.8 h

probabilities for rank 1 to 5 (low)

rank 1: <2%
rank 2: 11%
rank 3: 12%
rank 4: 13%
rank 5: 14%

Copernicus Climate Bulletin: the European + Global View

Wärmster Oktober in Europa im Copernicus-Datensatz

10. November 2020
Themen: **Klima**

Vor einigen Tagen haben wir berichtet, dass die Oktobertemperatur in der Schweiz unter der Norm lag. Betrachtet man unseren Kontinent, ergibt sich hingegen im Mittel über ganz Europa der wärmste Oktober im Copernicus-Datensatz ab 1979.
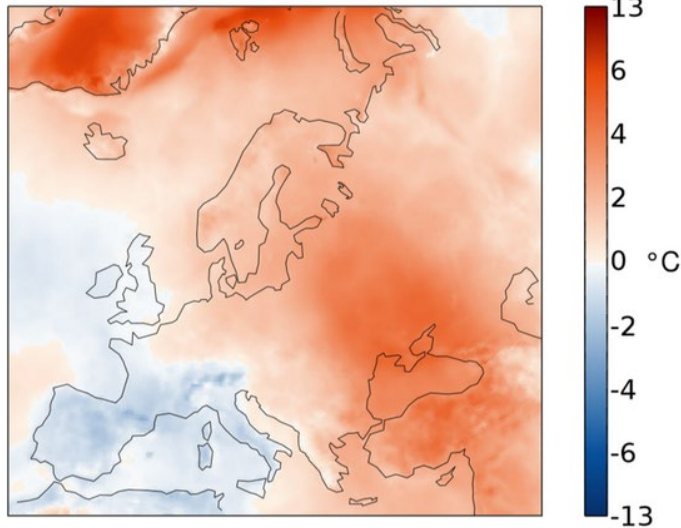
Abb. 1: Räumliche Verteilung der Oktobertemperatur 2020 in Europa. Dargestellt sind die Abweichungen (°C) zum Durchschnitt 1981–2010. Quelle: Copernicus.

Ort anpassen

Montag, 10:00 Uhr

3 °C

bedeckt

Prognose für die nächsten Tage

Di	Mi	Do	Fr	Sa
-1° | 1°	-3° | 2°	-2° | 1°	-3° | 2°	-1° | 4°

Great ICDR!
Our Climatologists 1:1 use it for informing the national public about the bigger picture

Challenges:
- Timing
- Reference Period
- Ranking
- Difference to national findings

https://www.meteoschweiz.admin.ch/home/aktuell/meteoschweiz-blog/meteoschweiz-blog.html?topic=/content/meteoswiss/tags/topics/klima
https://climate.copernicus.eu/surface-air-temperature-november-2020

Day-After Spatial Analyses: Weather Discussion in Forecasting Division

Combines Station + Satellite Data in single Analysis.

Relative Sunshine Duration (%) 2020–12–06

© MeteoSwiss

SreID v1.0, 2020–12–07 08:02
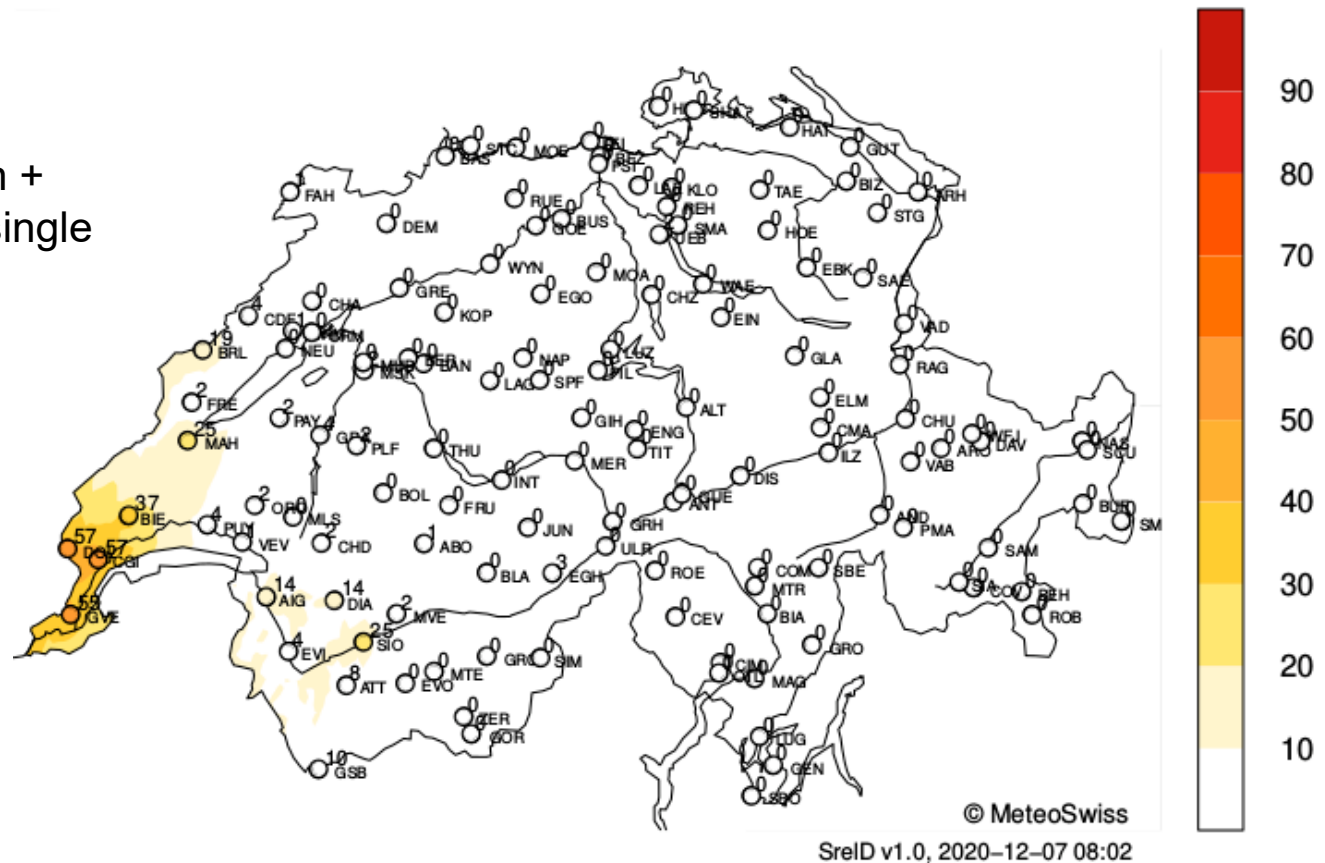
- Describes regional situation (Anomalies, Patterns).
- Anomalies relative to Norm Period (1981-2010, 1991-2020)

# Classification of Extraordinary Events: Storm Bianca (27.02.2020)

The classification of the event is based on extreme value analysis for very rare events and on empirical estimates for more common events. Both estimations use the maximum values per year within the reference period.
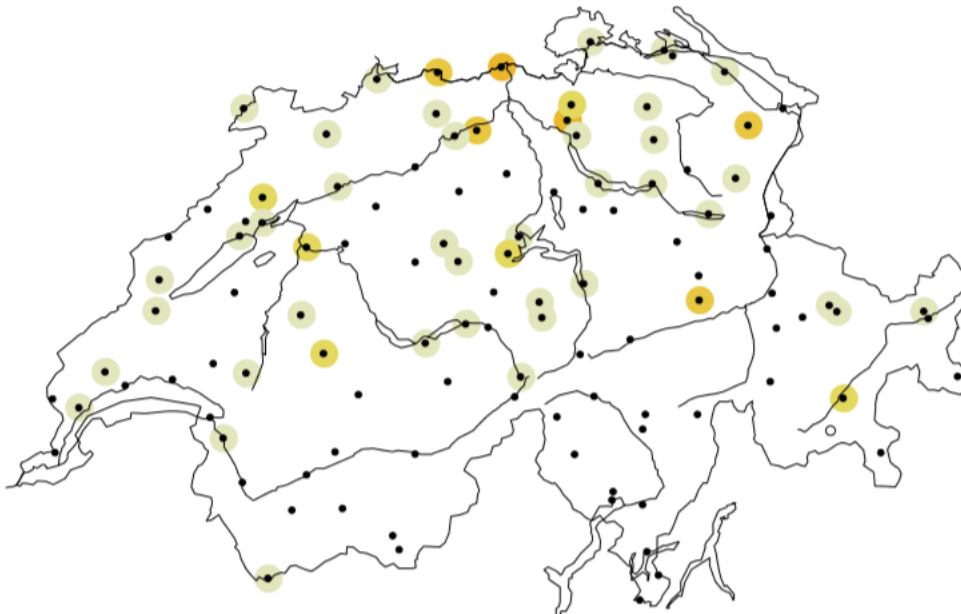
Return periods [years]

Empirical estimates (emp. RP); reference period 1981 - 2019.

< 1.1	1.1 - 3	2 - 5	3 - 8	5 - 10	8 - 15	10 - 25	15 - 30	> 25

Estimates of the return period based on extreme value statistics (EVA RP); reference period 1981 - 2019.

10 - 20	20 - 30	30 - 50	50 - 100	> 100
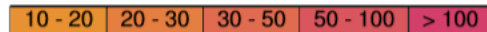
* Stations that are marked with a * have a data coverage of less than 60 %.

Day-after or even within event analysis

Stable Reference Climate Series (30+ years) is fundamental for real-time Classification and ranking in operational forecasting

Extreme Value Analysis: Norm Organizations and Legal Analyses

Disentis: 1197m, 46.71N, 8.85E

Extreme Value Analysis
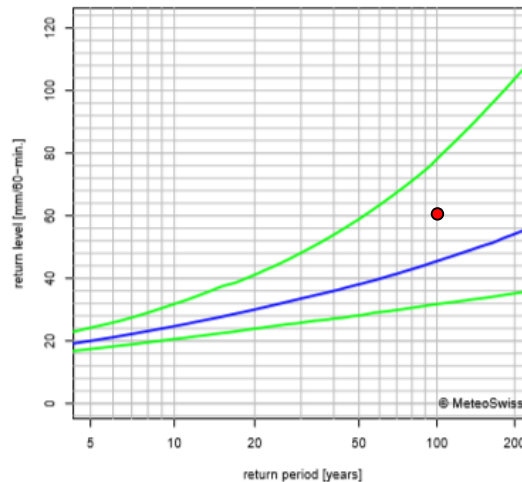
60-minute precipitation

1982 - 2018 (number of missing years: 0)

Bayes (seasonal maxima, GEV). **Reliability of results: good.**

- What is the return period for a given Event? → legal case about payment.

- For what precipitation values do we need to dimension national road drainages?

Plot of annual return levels and their uncertainty (ordinate) for a given return period (abscissa).

The estimated return levels are colored blue. The return level 95% confidence intervals are given in green.

The return periods for which the upper 95% confidence bound exceeds twice the best estimate are plotted on a grey background.

© MeteoSwiss

50–year return level (mm), year
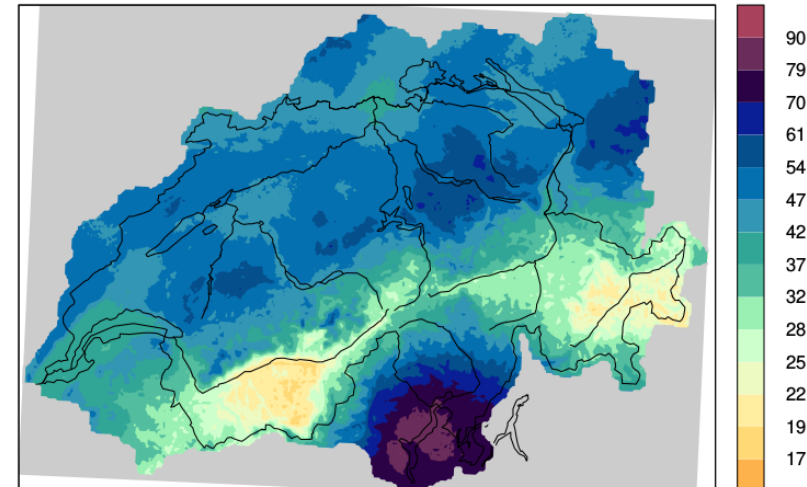
Table of the largest annual extrema in the period analysed.

If two large events occur in the same year, only the largest will appear in this table.

date	precipitation [mm/60-min.]	estimated return period [years]
2018-08-06	34.6	34
2015-07-17	30.3	21
1989-08-11	29.7	19
1995-07-21	26.8	13
2005-05-28	26.3	12

Summary & Discussion

What is the end user application for your TCDR/ICDR?

➢ How about offering consulting in addition to data?

Climate Impact Variables: Temp, Precip, Wind gust. How do you plan to improve those with satellite-based CDR's?

➢ Think about moving away from pure observations. Integration into classical measurement networks?

Satellite-based TCDR vs. 150 year long surface observations

➢ TCDR to cover a standard WMO Norm Period

Combine Forecast with Monitoring: ICDR + Models?

➢ Day-After as Threshold. Month before as Goal.

TCDRs are the basis for event classification & EVA

➢ Find out how TCDR's perform during extreme events compared to classical analyses. Build user confidence.