Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Bundesamt für Umwelt BAFU Bundesamt für Meteorologie und Klimatologie MeteoSchweiz Bundesamt für Landestopografie swisstopo

The Swiss early detection and warning system for drought

IDMP Virtual Exchange on 27 May F. Hüsler et al.







Drought in Switzerland?



Aggregated damage in CHF billion

Frequency (once in x years)

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The mission



Challenges: what is a drought?



Socio-economic and ecological drought + enhancing risk for **cascading effects** (forest fire, heat, heavy precip, landslides,...)

Slow onset process: Impacts increase over time

The core components of the system

M Pr	odels/ redictions	In-si mea data	itu asuremei	Satellite data	Informa measure impacts	tion (on es and	Weekly briefings (Bulletins)
	Monitoring		Fore	ecast	Warnin	gs	Information

The national drought system

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https://youtu.be/K8WepUyKrtw

User-centered design

«Science-driven» design Soil moisture SPEI-3 SPI-3 **Combined Index** $t_1, t_2, t_3, \ldots, t_n$

«User-centred» design



Regional and temporal information



	Current situation	Annual comparison	Time series
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All influencing factors at a glance (last 6 months, next 4 weeks)

- Combined Drought Index
- Precipitation
- Discharge at station
- Lake level
- Soil moisture [%ufc]
- Groundwater
- Vegetation condition
- etc.

Regional and temporal information

astern Swiss Plateau

Current situation

Annual comparison

Time series

All influencing factors at a glance (comparison between years)

- Combined Drought Index
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- etc.

A variety of further products



The combined drought index CDI

- Based on observations and model data for precipitation, modelled soil moisture and runoff
- All input variables are forecasted with 4 weeks lead time for each of the 38 warning regions
- The warning is based on the CDI

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östliche Zentralschweiz

Warning strategy

Level green (no or low danger): The situation is not unusual.



Level red (high risk): Exceptional situation. Extreme drought with far-reaching impacts. Follow instructions from local authorities.



How would it have worked in 2018?



Soil moisture measuring network



Aim: a comprehensive, quality-controlled set of in situ soil moisture data for Switzerland, suitable for a wide range of applications

Take home

- The new operational early detection and warning system is available for Switzerland under www.drought.admin.ch
- It seeks to take into account the complexity of the drought phenomena best possible (warning strategy, temporal context) – however challenging ("reality check" is needed)
- It has been **co-designed** with users to best respond to their needs
- A monitoring and forecasting system is only the first pillar of an integrated drought management strategy
- New products are continuously developed and improved (satellite data, soil moisture monitoring network, water-T forecast etc.)

Sincere thanks to the whole team of FOEN, MeteoSwiss and Swisstopo!

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Thank you!

E.Mart.

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An Realization Dair Mar

/isit <u>www.drought.admin.ch</u>

Vegetation Stress Map: «daily»,10x10m (Forest) Summer 2019 Summer 2021



https://s.geo.admin.ch/y6wuecltmbeb

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https://s.geo.admin.ch/gb04tinfnugi

Credits: Swisstopo

CDI vs. drought warnings



- 5 levels
- Automatically calculated and predicted for each week
- Provides an assessment of the rarity of a multifactorial water deficit
- Provides a basis for decision-making
- Updated daily



- 3 levels (traffic light system)
- Evaluated by experts
- Takes into account the duration and intensity of an event
- Can consider other factors depending on the situation (e.g., low sea levels, lack of snow)

Forecasts

Example – Summer 2022

- A high degree of uncertainty is unavoidable
- Decision-making processes resulting from the warnings (including at the cantonal level) must take into account the concept of uncertainty

Niederschlagssumme der letzten 30 Tagen - östliches Mittelland Bias-corrected 6-week forecast from 2022/07/15 (51 members)



Credits: MeteoSchweiz

Levels of drought

