



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA  
Federal Office of Meteorology and Climatology MeteoSwiss

# How observations support the development of climate scenarios

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GAW-GCOS Symposium, 26.03.2026



**ETH** zürich



Schweizerische Eidgenossenschaft  
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National Centre for Climate Services NCCS

und weitere  
Partner



# Swiss Climate Scenarios

**IPCC AR7**  
2027-2029



**IPCC AR6**  
2021-2023

**Klima CH2025**



**04 November 2025**

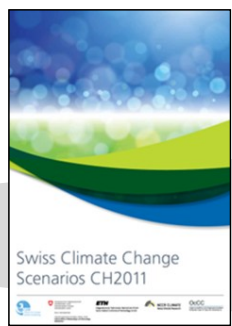
**IPCC AR5**  
2014

**CH2018**



**IPCC AR4**  
2007

**CH2011**



**IPCC TAR**  
2001

**IPCC AR4**  
2007

**«CH2007»**



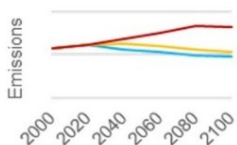
*Comprehensiveness, Complexity, Level of Detail*



# Typical processing chain



Emission Pathways  
(SSP-RCP)



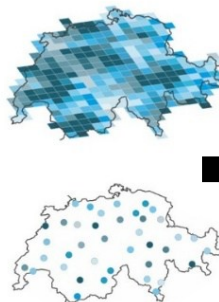
Global  
Climate Model  
(100-250km)



Regional  
Climate Model  
(12km)



Local Scale



**Klima CH2025  
products**



Dynamical  
Downscaling

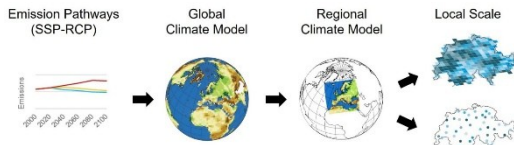
Statistical bias correction  
and downscaling  
+  
Block-Time-Shift approach  
to correct for GCM-RCM  
inconsistencies



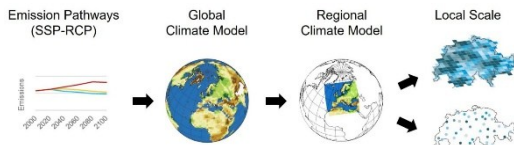
# Multimodel Ensembles



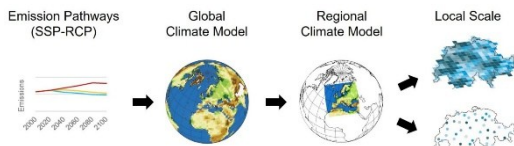
Simulation #1



Simulation #2

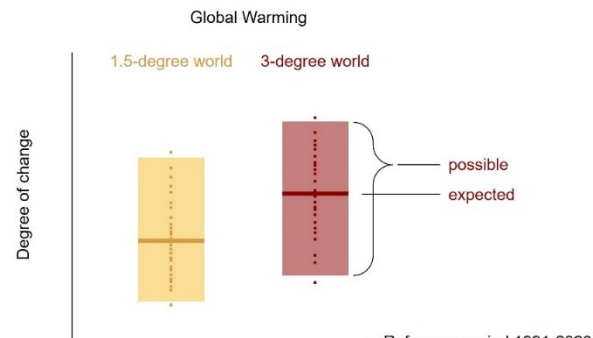
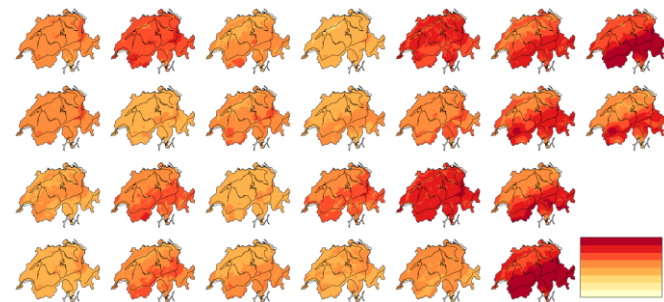
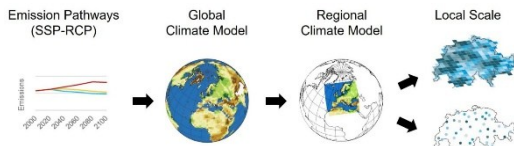


Simulation #3



...

Simulation #n

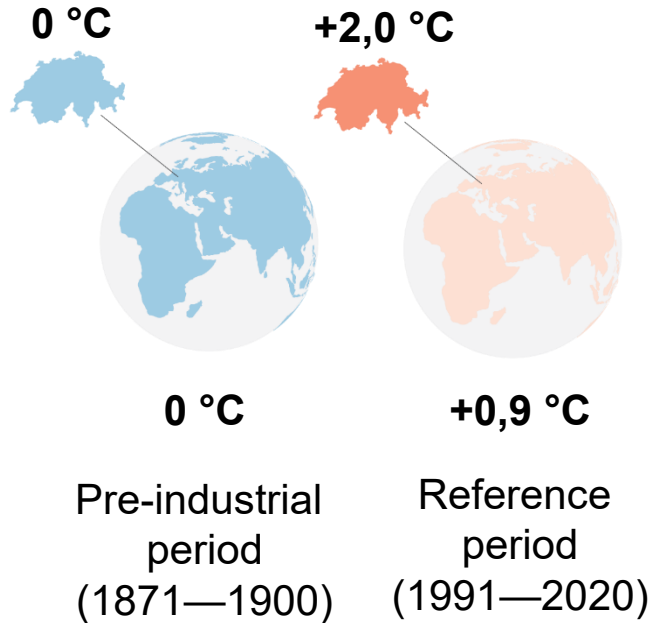




# Global Warming Levels (GWLs)



## Observed:



Target

Intention

Behavior



Switzerland is severely affected

Swiss average temperature

until 1991-2020: **+2.0 °C**  
since pre-industrial  
in addition\*: **+2.9 °C**  
in a 3-degree world



Less snow



Average zero-degree line in winter

until 1991-2020: **+480 m**  
since 1901  
in addition\*: **+550 m**  
in a 3-degree world

Every tenth of a degree counts



More frequent and more intense heavy precipitation

Intensity of a 1-day precipitation event with return period 50 years

until 1991-2020: **Increase confirmed**  
in addition\*: **+11 %**  
in a 3-degree world



More extreme heat

Warmest night of the year

until 1991-2020: **+3.2 °C**  
since 1901  
in addition\*: **+3.8 °C**  
in a 3-degree world



Drier summers

Summer drought

until 1991-2020: **Increase confirmed**  
in addition\*: **+44 %**  
in a 3-degree world



Historical based on observations

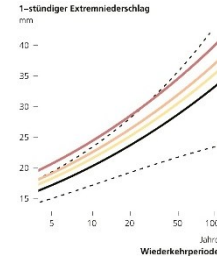
In addition in a 3-degree world



**Video**



**Brochure**



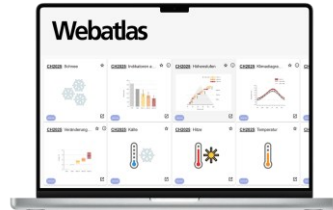
**Note on extreme precipitation**



**Scientific Report**



**Website**



**Webatlas**

**Processes and extremes**



**Data**

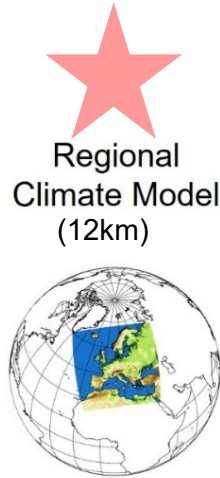
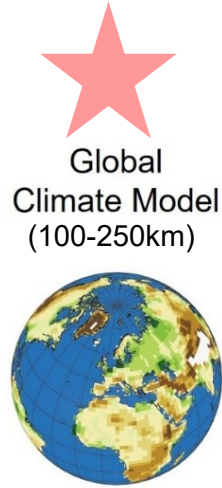
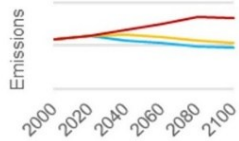
**Level of complexity**



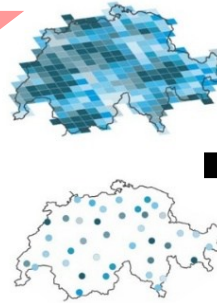
# The role of reliable observations



Emission Pathways  
(SSP-RCP)



Local Scale

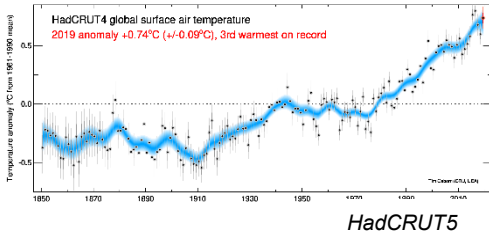


Need for observations



# What observations are used?

## Global observations



## European scale observations (e.g. EOBS)

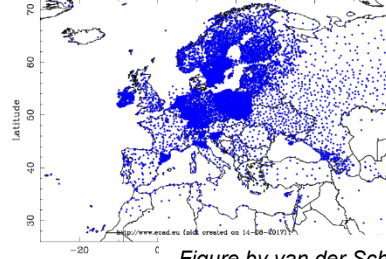


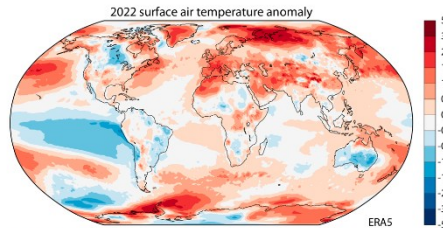
Figure by van der Schrier

## Swiss station observations (incl. urban stations)



MeteoSwiss

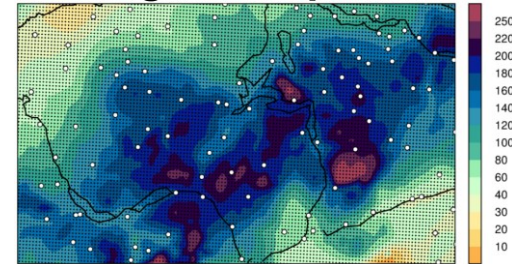
## Regional and global reanalyses



Copernicus Climate Change Service  
 PROGRAMME OF THE EUROPEAN UNION  
 Copernicus  
 ECMWF

ERA5

## Swiss gridded products



MeteoSwiss

Global

Regional

Switzerland



# Climate models



- **3-dimensional** grid (horizontal & vertical)
- **Numerical and mathematical description** of the most important climate processes on a global and regional scale
- Based on fundamental **physical equations**: conservation of energy, momentum and mass
- **Complex** and **computationally expensive**

## Observations?



- **Calibration** of parametrizations for physically unresolved processes (e.g. cloud condensation, roughness effects)
- **Tuning** of models





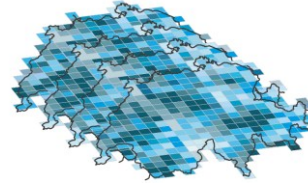
# Bias Correction & Downscaling



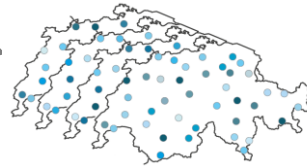
## Observations



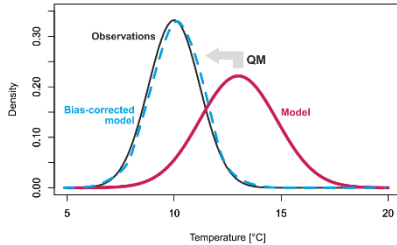
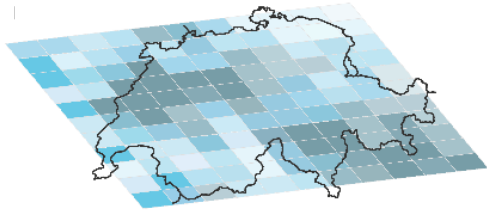
1km



stations



Model simulation



## Observations?



- Reference datasets
- Statistical bias correction
- Statistical downscaling

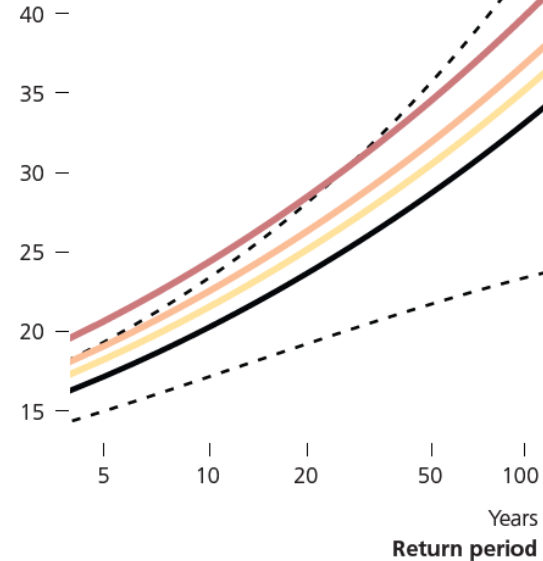


# Scenario Products (examples...)



- Bridging models and observations  
→ Integrative view on climate change  
«past – present – future»
- **Urban information**
- **Scaling of extreme precipitation**
- Etc.

1-hour extreme precipitation  
mm



1.5-degree world  
2-degree world  
3-degree world

Observations:  
— Estimate (1991–2020)  
- - Uncertainty



# Conclusions

[www.climate-scenarios.ch](http://www.climate-scenarios.ch)



## Reliable long-term observations needed for the creation of climate scenarios

- Climate model development (calibration/tuning)
- Climate model evaluation
- Translation of climate model output to the impact scale (bias correction and statistical downscaling)
- Integrative view on climate evolution from past to present to future
- Product development

[www.climate-scenarios.ch](http://www.climate-scenarios.ch)

**Thank you to the  
whole project  
team!**





# Translation into time and scenarios



## Time of reaching a global warming level

