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CH2018 – Swiss Climate Change Scenarios

Overview of climate indicators in CH2018

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1. Introduction

The CH2018 Swiss Climate Change Scenarios show where and how climate change will likely affect Switzerland. If greenhouse gas emissions continue to rise unabated, Switzerland will have to adjust to four main changes until the middle of this century, in addition to rising air temperature, i.e.: dry summers, heavy precipitation events, more hot days, and more winters with little snow. The Climate Change Scenarios also show the potential of global mitigation measures to reduce climate change in Switzerland.

The CH2018 Climate Change Scenarios are the basis for planning climate adaptation measures. Users receive specific information on likely future climate development in Switzerland, in its geographical regions, in its cantons and for individual stations in the form of text, graphics and data. There are thousands of figures and their underlying data that can be displayed interactively and are downloadable from the CH2018 web atlas. The figures are available for all future periods and all emission scenarios in four languages. In addition, users can request the spatially downscaled daily time series of different climate variables at stations (DAILY-LOCAL) as well as on a regular 2 km grid (DAILY-GRIDDED).

This document aims to provide an overview of the definitions used in CH2018 because the climate indicators can be defined in different ways and the set of indicators covered in CH2018 has been expanded since these climate scenarios were published. This is to avoid confusion and inconsistencies and to provide an overview of all available indicators.

2. Definition of climate indicators

All climate indicators were calculated for each model simulation individually and were then averaged over 30 simulation years. In some cases, the analysis was carried out on a seasonal basis in addition to the annual basis, i.e., separately for the four climatological seasons. Generally, three estimates were calculated for each indicator: The medium estimate corresponds to the median across all models per emission scenario. The lower and upper estimates correspond to the 5^{th} and 95^{th} percentile, respectively, over all models per emission scenario. The DAILY-LOCAL and DAILY-GRIDDED datasets denote the downscaled and bias-corrected CH2018 datasets, while EURO-CORDEX denotes the raw and unprocessed climate simulations.

Climate indicator	Abbr.	Definition	Data basis	
Temperature	tas	Daily mean temperature	DAILY-LOCAL DAILY-GRIDDED	absolute values, change signal
Maximum temperature	tasmax	Daily maximum temperature	DAILY-LOCAL DAILY-GRIDDED	absolute values, change signal
Minimum temperature	tasmin	Daily minimum temperature	DAILY-LOCAL DAILY-GRIDDED	absolute values, change signal
Precipitation	pr	Daily precipitation	DAILY-LOCAL DAILY-GRIDDED	absolute values, change signal
Hot days	HD	Number of days per year with the daily maximum temperature > 30°C	DAILY-LOCAL DAILY-GRIDDED	absolute values
Summer days	SD	Number of days per year with the daily maximum temperature > 25°C	DAILY-LOCAL DAILY-GRIDDED	absolute values
Tropical nights	TN	Number of days per year with thedaily minimum temperature > 20°C	DAILY-LOCAL DAILY-GRIDDED	absolute values
Frost days	FD	Number of days per year with the daily minimum temperature < 0°C	DAILY-LOCAL DAILY-GRIDDED	absolute values
Icy days	ID	Number of days per year with the daily maximum temperature < 0°C	DAILY-LOCAL DAILY-GRIDDED	absolute values
Snow days	Snow days	Number of days per year with the daily mean temperature < 2°C and daily precipitation > 1 mm	DAILY-LOCAL DAILY-GRIDDED	absolute values
Cooling degree days	CoolingDD	Yearly temperature sum of the (positive) differences between the daily mean temperature and a threshold temperature (18.3°C)	DAILY-LOCAL	absolute values
Cold wave counter	CWC	Number of events with five or more consecutive days with the daily minimum temperature < 0 °C	DAILY-LOCAL	absolute values
Diurnal temperature range	DTR	Daily range between the minimum and maximum temperature	DAILY-LOCAL	absolute values

Freezing degree days	FDD	Yearly temperature sum of the (positive) differences between the daily mean temperature and the freezing point (0 °C) during days with the daily mean temperature < 0 °C an	DAILY-LOCAL	absolute values
Growing degree days	GDD	Yearly temperature sum of the (positive) differences between the daily mean temperature and a threshold temperature (5 °C)	DAILY-LOCAL	absolute values
Growing season length	GSL	Yearly number of days which are between the first occurrence of a 6-day-period with the daily mean temperature > 5 °C and the first occurrence of a 6-day-period with the daily mean temperature < 5 °C after 1 July	DAILY-LOCAL	absolute values
Heating degree days	HDD	Yearly temperature sum of the difference between the daily mean temperature on days with the daily mean temperature > 12 °C and a threshold temperature (20 °C)	DAILY-LOCAL	absolute values
Heat wave counter	HWC	Number of events with five or more consecutive days with the daily maximum temperature > 30 °C	DAILY-LOCAL	absolute values
Mean maximum heat wave length	MHWL	Length of the longest consecutive period per year with the daily maximum temperature > 30 °C	DAILY-LOCAL	absolute values
Mean maximum temperature over 14 days	MMT	Yearly maximum of the daily maximum temperature averaged over 14 days	DAILY-LOCAL	absolute values
Thawing degree days	TDD	Yearly temperature sum of the difference between the daily mean temperature and the freezing point (0 °C) during days with the daily mean temperature > 0 °C	DAILY-LOCAL	absolute values

Maximum number of consecutive dry days	CDD	Maximum number of consecutive dry days (daily precipitation < 1 mm) per period (season, year) (Frich et al., 2002; Alexander et al., 2006)	EURO-CORDEX	change signal
Precipitation minus evaporation	P-E	Precipitation minus evaporation (Greve & Seneviratne, 2015; Byrne & O'Gorman, 2015)	EURO-CORDEX	change signal
Standardized soil moisture anomaly	SMA	Standardized anomaly of the total simulated soil moisture (Dai, 2012; Orlowsky & Seneviratne, 2012)	EURO-CORDEX	change signal
3-months standardized precipitation index	SPI3	Standardized precipitation index for precipitation sums over 3 months (McKee et al., 1993; Lloyd-Hughes & Saunders, 2002)	EURO-CORDEX	change signal
Coldest night of the year	TNn	Yearly minimum of the daily minimum temperature	EURO-CORDEX	change signal
Hottest day of the year	TXx	Yearly maximum of the daily maximum temperature	EURO-CORDEX	change signal
Very hot days	TX99P	Number of days per year with daily maximum temperature > 99th percentile of the daily maximum temperature in the reference period	EURO-CORDEX	change signal
Wet-day frequency	FRE	Number of days per year with daily precipitation >= 1 mm/day	EURO-CORDEX	change signal
Wet-day intensity	INT	Mean precipitation on wet days with daily precipitation >= 1 mm/day	EURO-CORDEX	change signal
Mean daily precipitation	MEA	Mean daily precipitation over all days	EURO-CORDEX	change signal
Precipitation	pr	Mean daily precipitation over all days	EURO-CORDEX	change signal
95th/99th percentile of all-day precipitation	Rp95 Rp99	95th / 99th percentile of daily precipitation over all days (dry and wet days)	EURO-CORDEX	change signal
Maximum 1-day, 3-day, 5-day precipitation	Rx1d Rx3d Rx5d	Maximum precipitation over 1/3/5 day(s)	EURO-CORDEX	change signal

Return levels for 1-day, 3-day, 5-day precipitation	x1d.5, x1d.10, x1d.20, x1d.50, x1d.100 x3d.5, x3d.10, x3d.20, x3d.50, x3d.100 x5d.5, x5d.10, x5d.20, x5d.50, x5d.100	5-, 10-, 20-, 50-, 100-year return levels for 1-/3-/5-day precipitation events. The return levels were estimated using extreme value theory (Rajczak und Schär, 2017; nach Frei et al., 2006)	EURO-CORDEX	change signal

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