

Change in Run-Of-River Power Production Calculated with the New Climate Change Scenarios CH2018

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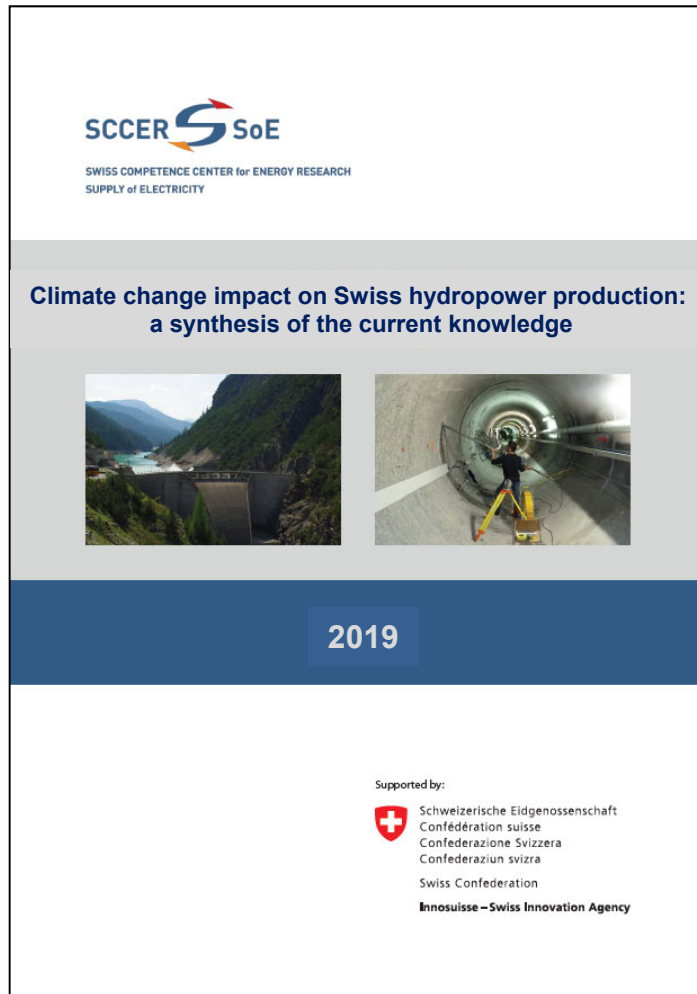
Schweizerische Eidgenossenschaft
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Swiss Confederation

Commission for Technology and Innovation CTI

SCCER SoE Task 2.1 meeting,
03 Sep 2019, Lausanne

SCCER SoE synthesis «Climate change impact on Hydropower production»

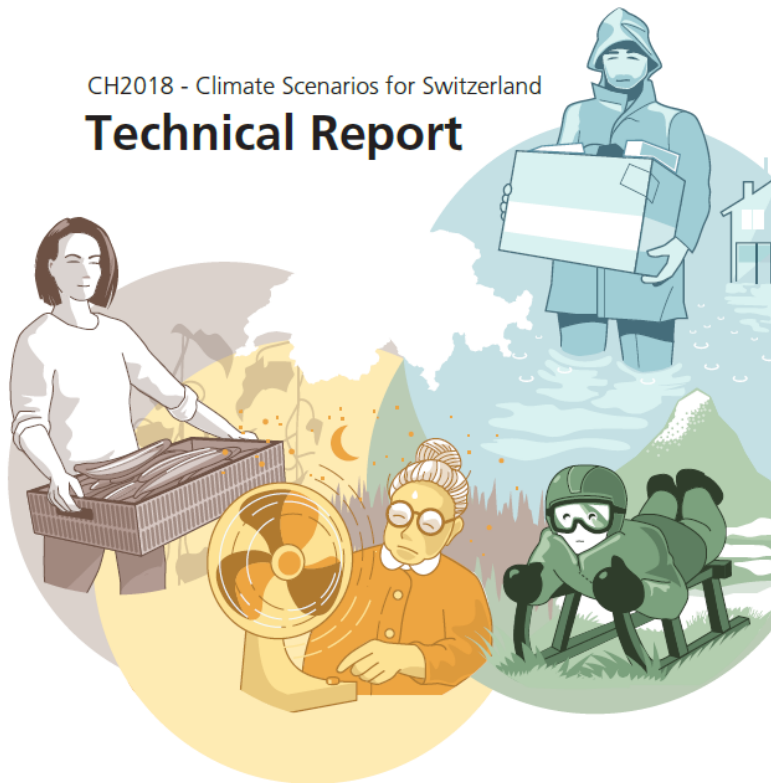




Run-of-river power plant Birsfeld (Photo: commons.wikimedia.org)

CH2018 – Update of the climate change scenarios for Switzerland

CH2018 - Climate Scenarios for Switzerland Technical Report

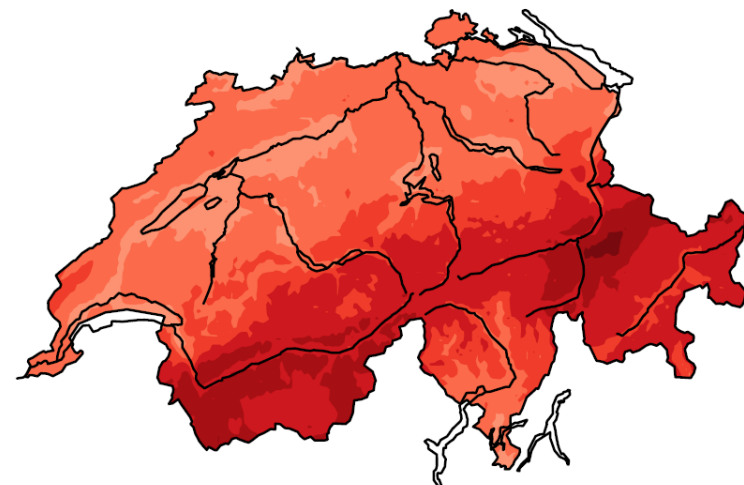


Temperatur

Abweichung von der Normperiode 1981-2010

2060
Sommer

RCP8.5
Mittlere Schätzung



1 1.5 2 2.5 3 3.5 4 4.5 5
Abweichung (°C)

Calculating the change in RoR power production



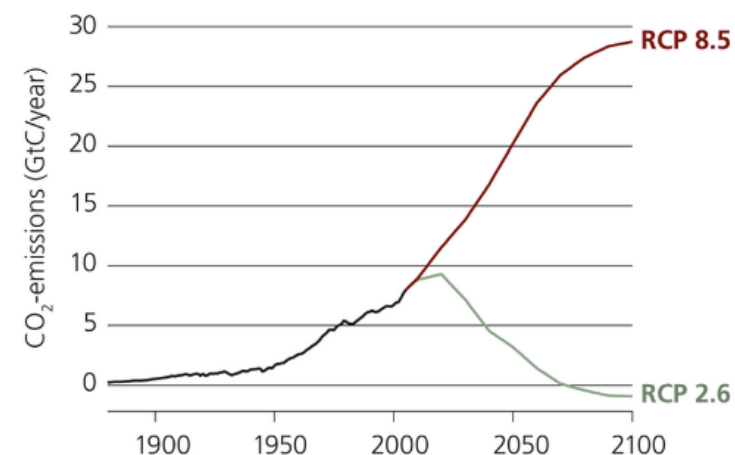
Emission scenarios

Global net fossil fuel and industrial CO₂ emissions.

(Source: adapted from IPCC 2013/WGI/Box 1.1/Figure 3b)

— No climate change mitigation

— Concerted mitigation efforts

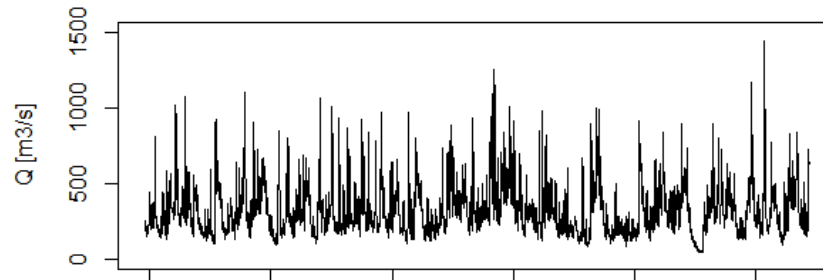


Mid-century or 2060: Refers to the period from 2045 to 2074

End of the century or 2085: Refers to the period from 2070 to 2099

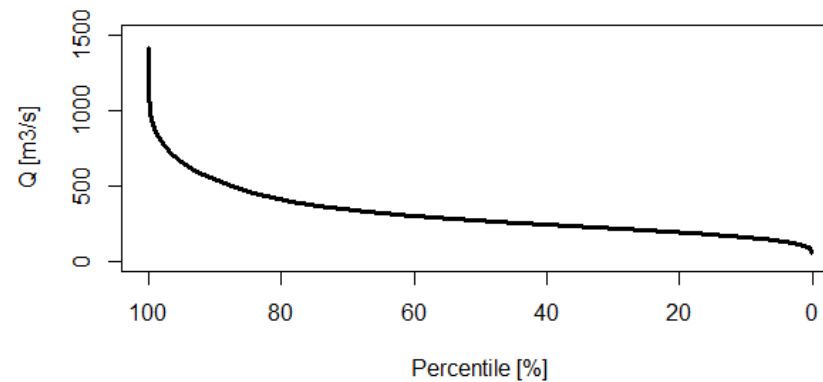
Calculating the change I

Step 1:



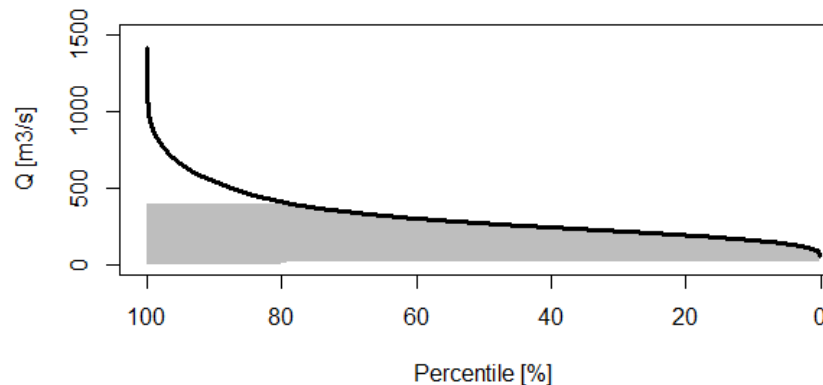
Measured (1981-2010) or simulated (future; with changed meteorological variables) **daily mean runoff**

Step 2:



Construction of **Flow Duration Curve** (ordering by size) for a year or a half-year

Step 3:



Calculation of the **usable water volume**

Calculating the change II

$$P [kW] = \varphi * g * \eta * MQ \left[\frac{m^3}{s} \right] * h[m]$$

$$P [kW] = 1 * 9.81 * 0.8 * MQ \left[\frac{m^3}{s} \right] * h[m]$$

φ = Density g = Gravitation η = Efficiency	}	~8
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Calculation of the current and future **power production** with the assumption of unchanged installation and residual flow regulations

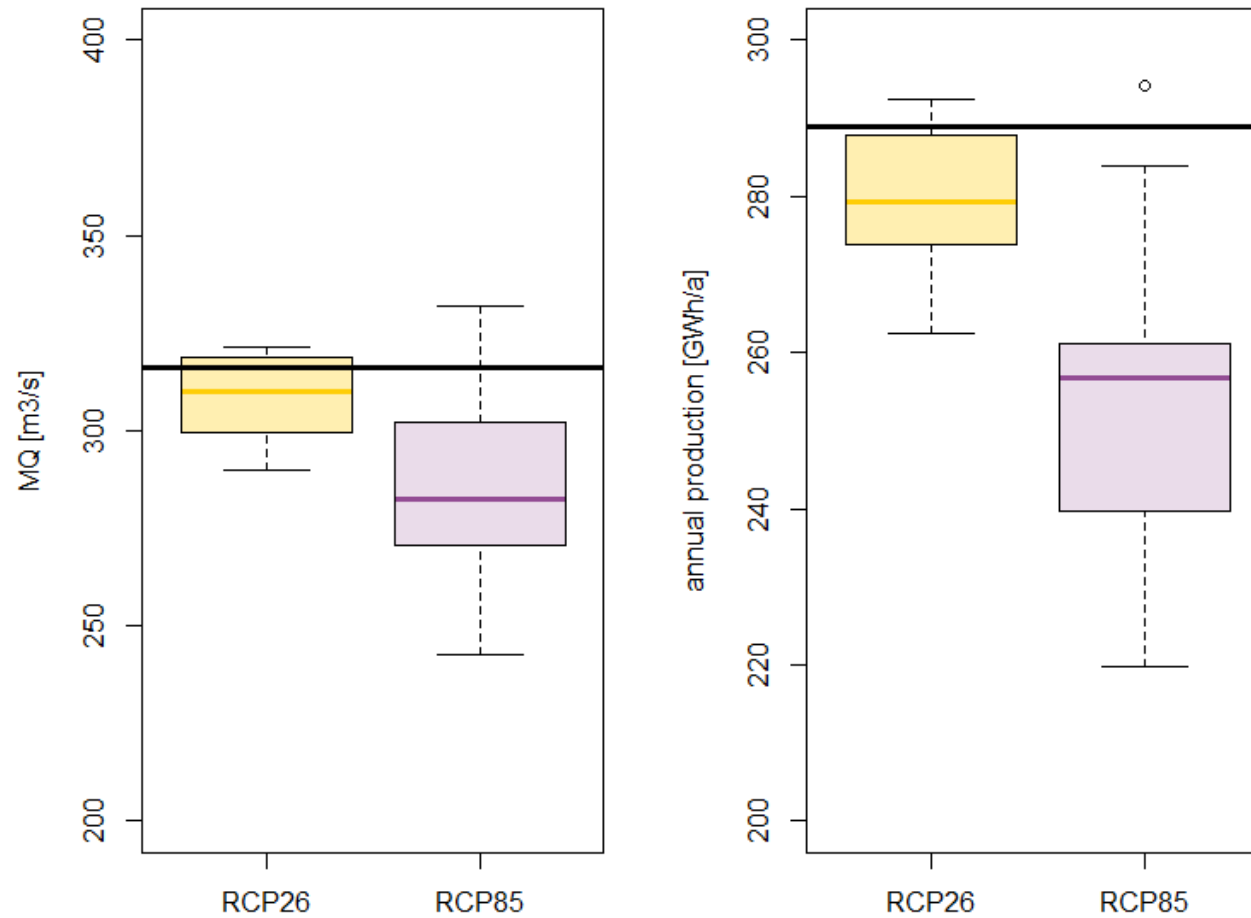
Selection of RoR plants in Switzerland

Name of power plant	River	Annual production according to operators [GWh/a]	Annual production calculated [GWh/a]
Albbruck-Dogern	Rhein	580	581.4
Birsfelden	Rhein	550 – 560	556.8
Amsteg	Reuss	460	461.7
Lavey	Rhone	400	412.1
Biaschina	Ticino	380	360.6
Wildegg-Brugg	Aare	300	289.2
Aletsch	Massa	138	183.2
Reichenau	Rhein	110	111.6
Aue	Limmat	27	27.8
Windisch	Reuss	12	12.3
Glaris	Landwasser	7.8	7.5

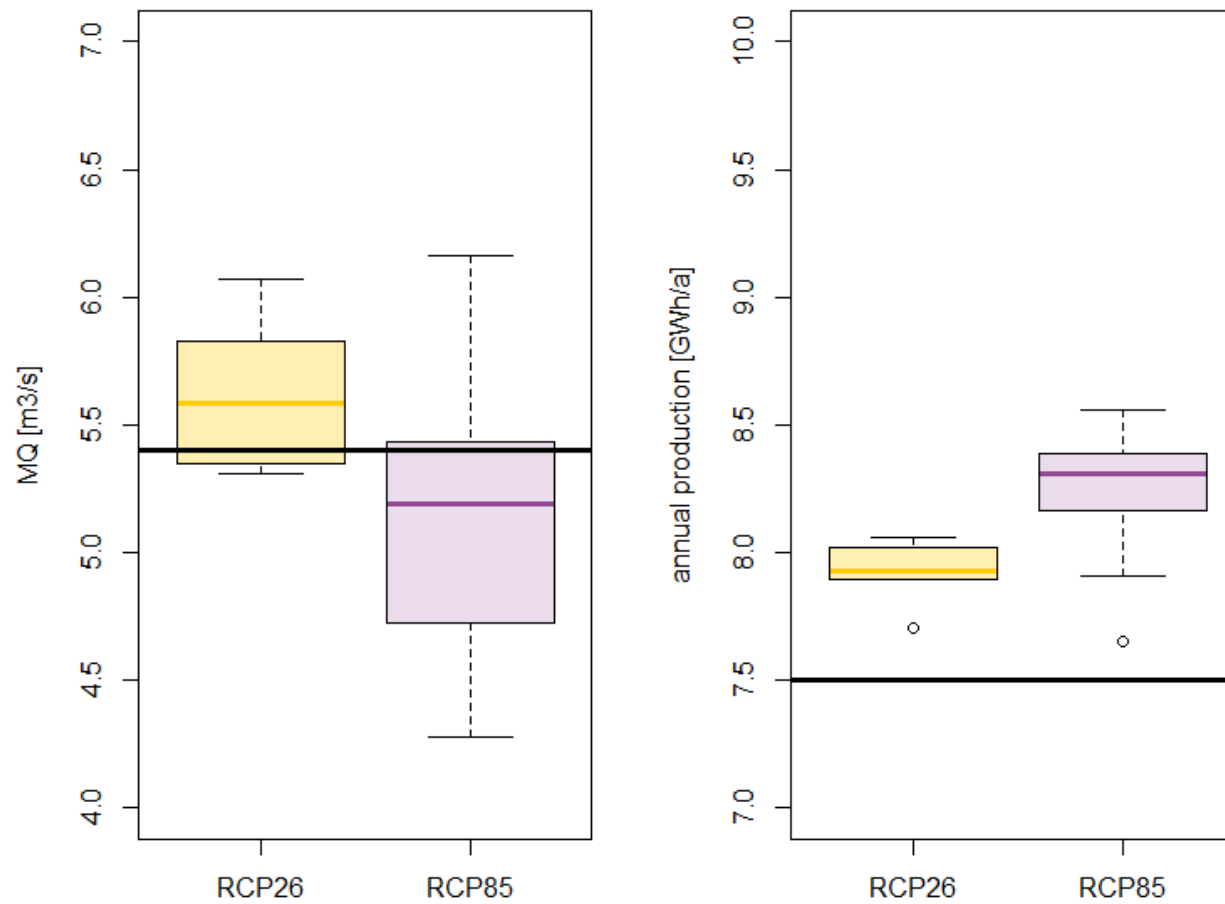
hier vielleicht noch die fehlenden Werte in Spalte 3 ergänzen

Manfred Stähli; 15.08.2019

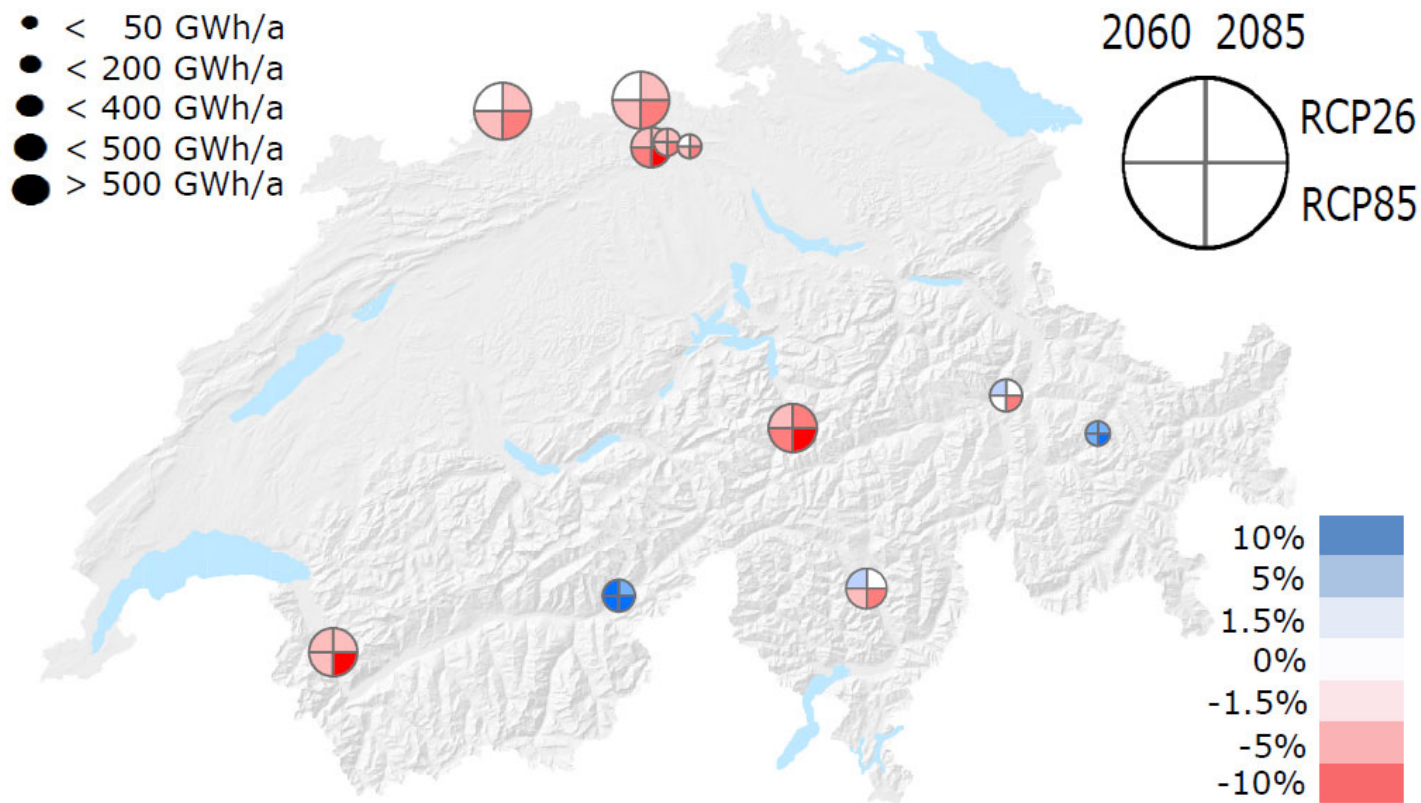
Results: HP plant Wildegg-Brugg - Aare



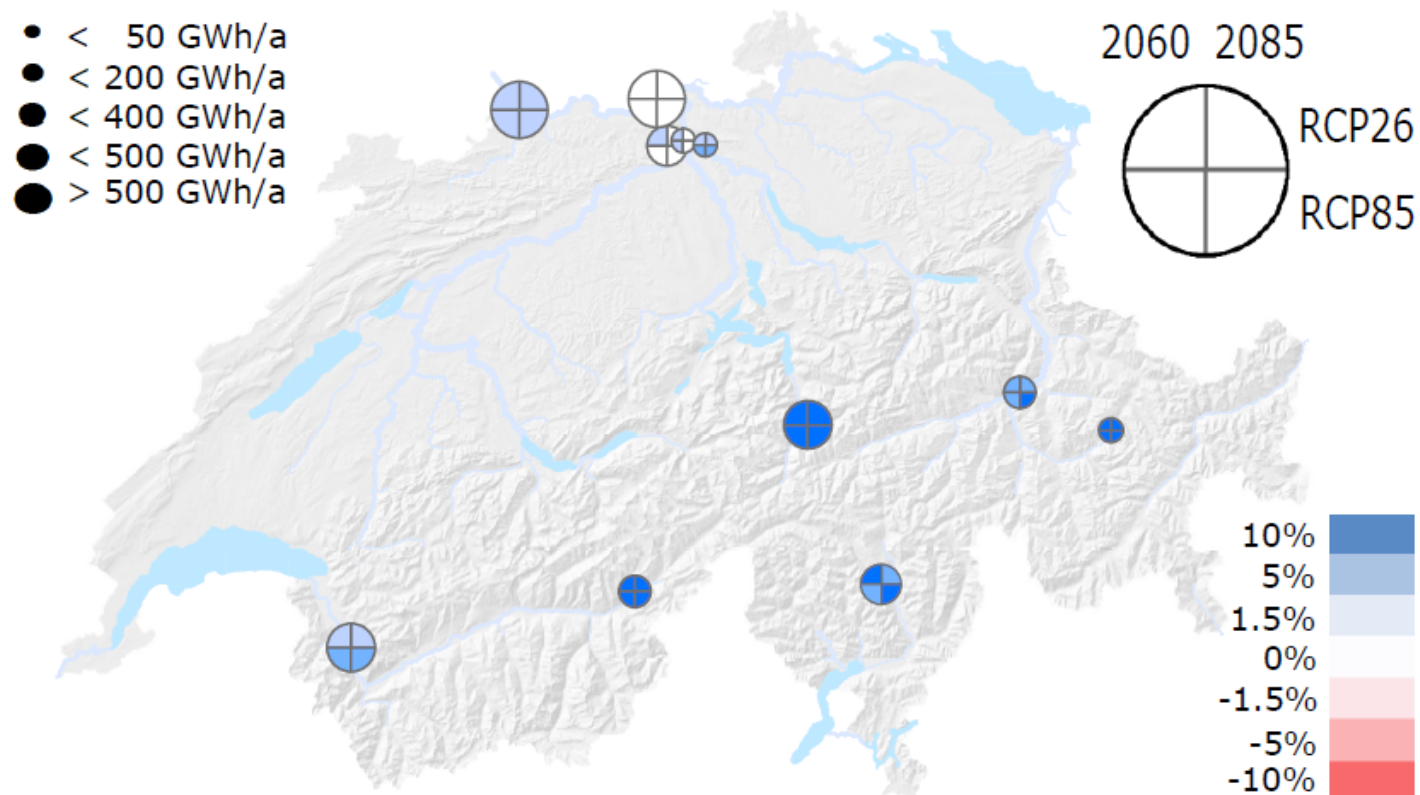
Results: HP plant Glaris (Davos) - Landwasser



Change in mean **annual** production

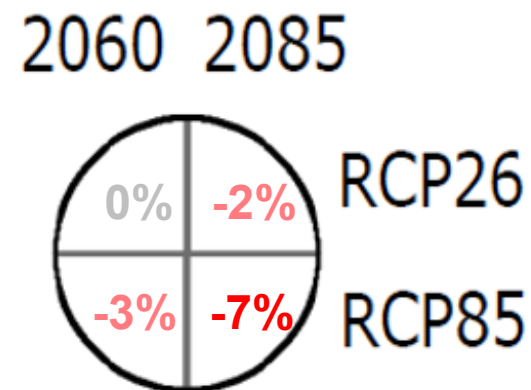


Change in mean **winter** production



Projection for RoR power production in Switzerland

- Annual production:



- Winter production:

