Geophysical Research Abstracts
Vol. 16, EGU2014-9916, 2014
EGU General Assembly 2014

Projected changes in precipitation intensity and frequency over complex topography: a multi-model perspective

Andreas Fischer (1), Denise Keller (1), Mark Liniger (1), Jan Rajczak (2), Christoph Schär (2), and Christof Appenzeller (1)

(1) Federal Office of Meteorology and Climatology MeteoSwiss, Climate Division, Zurich, Switzerland (andreas.fischer@meteoswiss.ch), (2) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

Fundamental changes in the hydrological cycle are expected in a future warmer climate. This is of particular relevance for the Alpine region, as a source and reservoir of several major rivers in Europe and being prone to extreme events such as floodings. For this region, climate change assessments based on the ENSEMBLES regional climate models (RCMs) project a significant decrease in summer mean precipitation under the A1B emission scenario by the mid-to-end of this century, while winter mean precipitation is expected to slightly rise. From an impact perspective, projected changes in seasonal means, however, are often insufficient to adequately address the multifaceted challenges of climate change adaptation.

In this study, we revisit the full matrix of the ENSEMBLES RCM projections regarding changes in frequency and intensity, precipitation-type (convective versus stratiform) and temporal structure (wet/dry spells and transition probabilities) over Switzerland and surroundings. As proxies for raintype changes, we rely on the model parameterized convective and large-scale precipitation components. Part of the analysis involves a Bayesian multi-model combination algorithm to infer changes from the multi-model ensemble.

The analysis suggests a summer drying that evolves altitude-specific: over low-land regions it is associated with wet-day frequency decreases of convective and large-scale precipitation, while over elevated regions it is primarily associated with a decline in large-scale precipitation only. As a consequence, almost all the models project an increase in the convective fraction at elevated Alpine altitudes. The decrease in the number of wet days during summer is accompanied by decreases (increases) in multi-day wet (dry) spells. This shift in multi-day episodes also lowers the likelihood of short dry spell occurrence in all of the models.
For spring and autumn the combined multi-model projections indicate higher mean precipitation intensity north of the Alps, while a similar tendency is expected for the winter season over most of Switzerland.