

Seamless coupling of kilometer-resolution weather predictions and climate simulations with hail impact assessments for multiple sectors (scClim)

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Hail is a significant contributor to weather-related damages in Switzerland, driving a demand for actionable information on hail risks across sectors in current and future climate. The ongoing research project scClim (<https://scclim.ethz.ch/>) addresses this demand, uniting complementary expertise to establish a seamless model chain from observing and modeling the weather and climate to the quantification of hail impacts on agriculture, buildings, and cars. In this talk, an overview of the interdisciplinary research project is provided. The project is structured into five strongly interconnected subprojects. Subproject A engages in a close dialogue with key stakeholders to co-design a hail impact assessment platform, incorporating outcomes from the other subproject for practical applications. Subproject B develops an algorithm to track hail cells and applies it to operational weather forecasts and climate simulations to investigate hail cell characteristics. The kilometer-scale convection-permitting climate simulations over Europe are conducted with the regional model COSMO, with the HAIL-CAST hail growth model embedded. These simulations provide case studies and a 10-year climatology of present-day conditions and a 3 °C global warming scenario using a pseudo-global-warming approach. Subproject C generates a multi-decadal time series of past hailday occurrences in the Swiss radar domain to identify the drivers of inter-annual hail variability and changes in hail seasonality. Additionally, it explores the potential of polarimetric data from the Swiss weather radar network to provide information about the probability and size of hail on the ground. Subprojects D and E construct hail damage models for crops, buildings, and cars to extend the open-source impact modeling platform CLIMADA. The applied vulnerability curves are calibrated with damage data from 2002 to 2021, which was obtained from insurance companies. Ultimately, the developed framework is used to assess the implications of climate change for future hail risks in the addressed sectors.