Geophysical Research Abstracts
Vol. 21, EGU2019-2080, 2019
EGU General Assembly 2019

Cascading effects of extreme precipitation for three illustrative case studies

Simone Schauwecker (1), Gascón Estíbaliz (2), Park Shinju (3), Ruiz-Villanueva Virginia (1), Schwarb Manfred (4), Sempere-Torres Daniel (3), Stoffel Markus (1,5,6), Vitolo Claudia (2), Rohrer Mario (1,4)

(1) Climatic Change Impacts and Risks in the Anthropocene (C-CIA), Institute for Environmental Sciences, University of Geneva, Switzerland, (2) European Centre for Medium-Range Weather Forecasts (ECMWF), Reading, United Kingdom, (3) Centre de Recerca Aplicada en Hidrometeorologia (CRAHI), Universitat Politècnica de Catalunya (UPC), Barcelona, Spain, (4) Meteodat GmbH, Zurich, Switzerland, (5) Department of Earth Sciences, University of Geneva, Switzerland, (6) Department F-A Forel for Aquatic and Environmental Sciences, University of Geneva, Switzerland

Extreme precipitation events can have devastating impacts on society and economy. However, not only is the quantitative forecast of such events difficult and associated with large uncertainties, also are the potential consequences highly complex and challenging to predict. It is thus a demanding task to anticipate the impacts, even more so in situations where human lives or critical infrastructure might be at risk.
To assess the cascade of effects of heavy precipitation in an integrated or holistic way, we here refer to cascading effects as hazards involving infrastructure and the human system. Our approach is novel in the sense that we analyze the cascade from the predictability of the triggering precipitation event down to the level of impacts (occurred and avoided) in an integrated way. We analyze three examples for different precipitation types where the initial triggering event generated a cascade of events, namely a convective precipitation event in the Swiss Prealps, a freezing rain in Slovenia, and a heavy snowfall episode in Catalonia.
The selected examples confirm that damage of extreme precipitation events is clearly related to the public, emergency risk stakeholders' and decision makers' knowledge on potential cascading effects. Major challenges of predicting cascading effects are the high complexity, the interdependencies and the increasing uncertainty along the cascade. We propose a framework for cascading effects including two approaches: (i) one to analyze past events, which then serves a basis for a (ii) more generalized approach to anticipate potential cascading effects of extreme precipitation. Both approaches are based on pathway schemes that can be used e.g. in addition to numerical models or hazard maps to analyze and predict potential cascading effects, but also as training tools for emergency risk managers. These schemes can complement forecast and multi-hazard models and can help dealing in a graphical way with the growing uncertainty along the cascade that needs to be taken into account and communicated to emergency risk stakeholders and affected citizens.
We propose using such schemes also for other types of weather and climate induced hazards such as droughts, storms, heatwaves, even earthquakes or volcanic eruptions. Future research may also focus on the combination of hazard and risk maps with cascading effects.