Derivation of climate-indices and establishment of hazard-development-corridors along the ÖBB rail network

Christian Wally1,5,6, Sebastian Lehner2, Christoph Matulla2, Katharina Enigl2, Helene Müller3, Hans Peter Rauch3, Tabea Fian4, Georg Hauger4, Christian Rachoy5, and Florian Salinger5

1Institute of Meteorology and Geophysics, University of Vienna, Austria
2Climate Impact Team, Climate Research Branch, Central Institute for Meteorology and Geodynamics, Vienna, Austria
3Institute of Soil Bioengineering and Landscape Construction, University of Natural Resources and Life Sciences, Vienna, Austria
4Institute of Spatial Planning, TU Wien, Vienna, Austria
5ÖBB-Infrastruktur AG, Vienna, Austria
6Institute of Mountain Risk Engineering, University of Natural Resources and Life Sciences, Vienna, Austria

The Austrian Federal Railways (ÖBB) are operating about 4800 kilometers of railway track in all regions of Austria. Most parts of this infrastructure are exposed to various natural hazards like landslides, debris flows, rockfalls, floodings and avalanches but also extreme weather events like strong winds or extreme heat can disrupt railway traffic. The frequency of their occurrence is changing due to recent climate change.

We use over 2000 events from 1990 to 2018 and a principal component approach to create an event space which lets us combine events and meteorological data on a fine spatial grid. This is necessary to detect characteristic climate-indices (CIs) in temporal series of meteorological parameters, like temperature or precipitation, that have negative effects on railway operation or trigger natural hazards that do so. The results are evaluated using various multivariate statistic methods to quantify the quality of the found CIs.

After these steps we can estimate the frequency of CI occurrence in near (2036-2065) and remote future (2071-2100) by analyzing ensembles of downscaled GCM projections for different climate scenarios. The result are hazard-development-corridors that are a relative measure for the number of predicted hazard events during the two periods of time along the considered railway tracks.