Geophysical Research Abstracts
Vol. 15, EGU2013-4947, 2013
EGU General Assembly 2013

Interannual and decadal-scale variability in winter storms over Switzerland since end of the 19th century

Christoph Welker and Olivia Martius

Oeschger Centre for Climate Change Research and Institute of Geography, University of Bern, Switzerland (christoph.welker@giub.unibe.ch)

In Switzerland, damaging and potentially life-threatening high-wind events can often be attributed to mid-latitude winter storms. The scarce availability of long-term atmospheric data series has so far limited the analysis of interannual and in particular decadal-scale changes in hazardous winter storms over Switzerland.

In our study, we evaluate this variability on the basis of the Twentieth Century Reanalysis (20CR), a novel global atmospheric reanalysis which extends back to 1871, with 56 realisations for each 6-hourly time step. In the 20CR, only observations of synoptic surface pressure were assimilated and monthly sea surface temperature and sea ice distributions served as boundary conditions. We apply an objective cyclone identification and tracking scheme to the global sea level pressure data of the 20CR ensemble, i.e. to each of the 56 ensemble members. For Switzerland and during almost the whole period available, the 20CR shows relatively small values of the ensemble range (uncertainty), compared to other regions of the world.

We use historic wind speed measurements taken at Zurich climate station to evaluate the quality of 20CR wind data over Switzerland, in particular during the first half of the 20th century and earlier when surface pressure observations were sparser. On both interannual and decadal time scales, we find a good agreement between the 20CR and observations, concerning the winter storm variability over Switzerland.

One of the main conclusions of our study is that the North Atlantic Oscillation (NAO), regarded as the major anomaly pattern of the North Atlantic/European sector, alone does not necessarily provide a good description of the interannual variability in winter storms over Switzerland. In the 20CR, the year-to-year variability in winter storms over Switzerland is rather associated with a large-scale atmospheric pattern similar to a southeastward displaced NAO-like pattern. Also on shorter (i.e. synoptic) time scales, similar large-scale meteorological conditions were in general conducive to high-wind events in Switzerland, as e.g. during the intense winter storm “Kyrill” in January 2007.

A second main conclusion is that since end of the 19th century winter storms over Switzerland have revealed pronounced decadal-scale variability, with periods between approximately 36 to 47 years. We try to understand the physical mechanisms responsible for these decadal-scale winter storm variations over Switzerland e.g. by linking them with variations in the global ocean surface temperatures.