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Synoptic conditions of extreme wind storms over Switzerland

S. Goyette

Climate Research Lab., University of Geneva, 7 Chemin de Drize, CH-1227, Geneva, Switzerland (stephane.goyette@archi.unige.ch / Fax +41 (0)22 379 07 44)

Wind extremes impact heavily upon the natural environment and on human infrastructures. Along with the analysis of the impacts of strong winds at fine scales using state-of-the-art Regional Climate Models (RCMs) one important issue is related to the large-scale conditions driving these storms in the mid-latitudes and how these conditions will change in the future following global climate change caused by the increase of atmospheric greenhouse gases. Work is underway to analyse the synoptic conditions leading to extreme wind storms in Switzerland. Wind observations from the Swiss automated network (ANETZ) are averaged and the thirty most intense averages are considered. The time coordinates of these are sorted out and corresponding synoptic conditions are extracted from reanalysis dataset (NCEP-NCAR) over a spatial area covering the North Atlantic Ocean and Western Europe. Statistics of these storms are computed where a number of atmospheric and surface fields, including SSTs (AMIP), are analysed. A similar procedure is carried out with simulated GCM wind outputs from Hadley Centre (HADCM3 coupled ocean-atmosphere global model available in the EU 5th Framework Program "PRUDENCE") over the Swiss territory over the period 1961-1991 as well as these over the period 2071-2100 under the IPCC A2 greenhouse-gas warming scenario. Synoptic conditions of "observed" and simulated storms over the period 1961-1990 are found to be reasonably similar. A preliminary analysis of the differences in conditions between the 2071-2100 and the 1961-1990 periods indicate that despite some similarities in some of the flow fields the larger temperature contrast between land and sea tends to generate steeper temperature gradients which in turn tends to generate stronger flow and greater likelihood of instability. Many of these differences in the simulated conditions are presented in this paper.