Geophysical Research Abstracts, Vol. 9, 08464, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08464

Climate change impact on extreme precipitation and flood hazard in Europe

R. Dankers (1), L. Feyen (1), A. de Roo (1) and O.B. Christensen (2)

(1) Land Management and Natural Hazards Unit, Institute for Environment and Sustainability, DG Joint Research Centre, European Commission, Italy, (2) Danish Climate Centre, Danish Meteorological Institute, Copenhagen, Denmark

Floods have been the most reported natural disaster in Europe. Recent advances in climate modelling suggest that global warming will intensify the hydrological cycle and increase the magnitude and frequency of intense precipitation events in most parts of Europe, especially in the central and northern parts. This will likely contribute to an increase in flood hazard triggered by intense rain, particularly the occurrence of flash floods. Flood hazard may also rise during wetter and warmer winters, with increasingly more frequent rain and less frequent snow. On the other hand, ice-jam and early spring snowmelt floods are likely to reduce because of warming.

We present first results of an integrated modelling framework for the assessment of current and future flood hazard at the European scale. The socio-economic scenario considered is based on the IPCC SRES A2 (high emission scenario) storyline. Climate simulations were done with the regional climate model HIRHAM of the Danish Meteorological Institute, using boundary conditions from the global atmosphere-only model HadAM3H. Sea surface temperature and sea ice anomalies for the scenario time slice are calculated with the coupled atmosphere-ocean HadCM3 model. The RCM run for the A2 scenario has a spatial resolution of 12 km, which is currently the highest resolution available of the necessary simulation length (with European coverage). Two 30-year time slices have been simulated, corresponding to 1961-1990 and 2071-2100, respectively.

The climate forcing data from the RCM are transferred into river runoff estimates using the hydrological model LISFLOOD. This is a spatially distributed, mixed conceptual-physically based hydrological model that simulates the spatial and tem-

poral patterns of catchment responses in large river basins as a function of spatial information on topography, soils and land cover. It is one-way coupled with the regional climate model (RCM), i.e., there is no feedback from the hydrological model back to the climate model. Hydrological simulations on the basin scale using LISFLOOD run with a grid spacing of 5 km.

For the control and scenario run, the hydrological model calculates daily discharges at each grid within the area of interest. Changes in runoff statistics between the two time slices are determined employing extreme value analyses. The calculated changes in flood frequency and water level statistics yield an assessment of the expected changes in flood hazard, resulting from the emission scenario and climate model used. This can be expressed as a change in the discharge of a flood with a certain (e.g., 100 years) return period (change in intensity), or a change in the return period of a certain event (change in recurrence) under a changed climate. With a high-resolution digital elevation model, stream water levels are readily transferred into flooded areas and inundation water depths, and changes in flooded areas and water depths are determined for each return period.