Geophysical Research Abstracts
Vol. 12, EGU2010-2911, 2010
EGU General Assembly 2010

The statistical uncertainty of changes in winter storms over the North Atlantic and Europe in an ensemble of transient climate simulations

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Winter storms are among the most important natural hazards affecting Europe. We quantify changes in storm frequency and intensity over the North Atlantic and Europe under future climate scenarios in terms of return periods (RP) considering uncertainties due to both sampling and methodology. With this aim, ensemble simulations with the coupled ECHAM5/MPI-OM1 GCM for recent climate conditions (20C, 1960-2000) and future climate scenarios (SRES A1B and A2, 2001-2100) are analyzed. RPs of North Atlantic storms' minimum central pressure (CP) and maximum vorticity (VOR) remain unchanged by 2100 for both the A1B and A2 SRES scenarios compared to the recent climate (1960-2000). Whereas shortened RPs for VOR of all intensities are detected for the area between British Isles/North-Sea/western Europe as early as 2040. CP RP of future storms in this area are significant shorter only for lower intensity events. These results indicate that storms could become more intense during the 21st century. However, the changes in storm VOR RP may be unrealistically large: a present day 50 (20) year event becomes approximately a 9 (5.5) year event in both A1B and A2 scenarios by 2100. The detected shortened RPs of storms implies a higher risk of occurrence of damaging wind events over Europe.