Geophysical Research Abstracts
Vol. 14, EGU2012-9874, 2012
EGU General Assembly 2012

Xynthia: analysis of an exceptional extra-tropical cyclone

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Between end of February and early March, winter storm Xynthia has affected South Western Europe causing storm damage and flash floods along the Breton coast. The uniqueness of this storm refers to its path and the area of origin, being far southward of the usual North Atlantic storm track. In order to understand the course of the event, the storm development is first analysed by means of ERA-Interim data. An interesting feature is that Xynthia did not cross the polar jet. In fact, the existing split jet structure was responsible for enduring upper level divergence in the vicinity of the cyclone. The southerly area of origin (30N) raises the question to what extent latent heat release (LHR) contributes to the deepening and evolution of Xynthia. Therefore, sensitivity studies with the regional model COSMO-CLM have been carried to verify the amount LHR has on the cyclone development. First, a control simulation covering broad areas of the North Atlantic Ocean with a horizontal resolution of 0.22° shows the development of the storm in very good agreement with the development represented in the reanalysis data. In different sensitivity studies, the influence of LHR is examined. In a first approach, the sea surface temperature (SST) in the initial model fields was reduced in steps of 1K to a maximum decrease of 5K compared to the original SST field. The lowering of the SST was implemented only in the model area where Xynthia underwent massive deepening. The results show that the minimum core pressure remains about 10hPa higher than in the control simulation, while dynamical aspects like jet configuration did not change significantly. Another approach to quantify the amount of LHR on cyclone development is to disable the temperature increment due to latent heat effects. Finally, the energetics are examined to provide information about the environmental energy transfers being accountable for the evolution of the storm.