

# An approach to detect North Atlantic Polar Lows in Climate Mode Simulations

Matthias Zahn<sup>1,2</sup>, Hans v. Storch<sup>1,2</sup>, Stephan Bakan<sup>3</sup>

(1) University Hamburg, Meteorological Institute, Germany

(2) GKSS Research Centre, Institute for Coastal Research, Germany

(3) MaxPlanckInstitut für Meteorologie (MPIM), Germany

Polar lows are not properly resolved in global re-analyses. In order to describe the year-to-year variability and decadal trends in the formation of such meso-scale storms, atmospheric limited area models, which post-process re-analysis data, may be an appropriate tool. In this study the merits and potential of this approach demonstrated. Therefore we firstly show the results of three case studies in which we reproduced polar low occurrences with a limited area model/regional climate model (RCM/LAM). Secondly we present a first approach of using the findings of the latter issue.

A series of three week long ensemble simulations of weather situations over the NE Atlantic with a RCM/LAM (CLM) was conducted and its capability to reproduce polar lows was investigated. The model was run in two different ways:

1. in „normal mode“ with NCEP-NCAR re-analyses at the lateral and lower boundaries
2. in „spectral nudging mode“, in which additionally the NCEP-NCAR large-scale state was enforced on the simulation

To keep the influence of the initial field low, the simulations were run in climate mode; that is they were begun approximately two weeks prior to the polar low formation. Thus the dynamical development of the polar low formation should be independent of the details of the initialization.

It is shown that principally polar lows can be reproduced with CLM. When „spectral nudging“ is applied a polar low develops in all ensemble members and the simulations are very insensitive to the initial conditions. However there are differences in detail compared to observational data, e.g. extent of pressure decline and polar low's location. A digital bandpass filter was applied to the output fields to make the reproduced polar lows more distinctive.

Using such a filter and further constraints an algorithm was developed to detect polar lows automatically. This algorithm was applied to the outputfields of a long-term simulation (two years) and first, still preliminary, results of such gained statistics are shown.