Development of a Long-term Climatology of North Atlantic Polar Lows

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Polar lows are intense maritime storms sized below the scale of the coarsely resolved global re-analyses.

To investigate the frequency and trends and changes in their annual number, higher resolved data of the past state of the atmosphere are required. These were obtained via dynamical downscaling of the 6-hourly 1948-2006 NCEP/NCAR re-analyses with a Local Area Model (LAM). The LAM we used is CLM, the climate version of the 'Lokal Model' LM of the German Weather Service. It is shown, that this approach is capable of reproducing polar lows in the subarctic region of the North Atlantic.

Further an algorithm based on the bandpass filtered MSLP-fields, that were reproduced with CLM, is presented. By means of this tracking algorithm, polar lows could be detected and counted over a period of almost 60 years and a long-term climatology could be derived.

It is shown, that this climatology reveals consistency in terms of frequency and spatial distribution with limited observational evidence.

The number of polar low occurrences exhibits strong year-to-year variability but weak decadal variability and a negligible trend for the whole North Atlantic region as well as for various investigated subregions. High correlations between more frequent yearly numbers of polar lows and characteristic meridional seasonal mean flow regimes, which favor cold air outbreaks and upper air troughs, are found.