

Polar lows over Nordic seas from satellite observations and reanalysis data

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One of the most important types of vortices in the Arctic are polar lows. They are characterized by short lifecycle (less than one day) and a relatively small size (less than 1000 km). Storm waves and wind, icing on ships and offshore structures, and other extreme weather conditions associated with polar lows can cause significant damage to infrastructure, natural ecosystems and navigation in the region, the damage caused by catastrophic weather conditions may interfere with the extraction of natural resources in the Arctic shelf and marine transportation on the Northern Sea Route (Khon et al., 2010). Global warming and associated sea ice retreat in the Arctic lead to increase of frequency of extreme events along the Northern Sea Route (Khon et al., 2014), possibly associated with polar lows. The analysis of polar lows activity and their changes is one of the key problems in assessing climate changes in the Arctic region.

The characteristics of extreme mesocyclones (polar lows) for the period 2002-2008 are investigated. The ability of the reanalysis data to simulate polar lows over Nordic seas in comparison with satellite observations is assessed. 4 reanalyses (ERA-INTERIM, ASR, NASA-MERRA and NCEP-CFSR) with different resolutions are considered (Fig. 1). Reanalyses are able to represent ca. 75% of the observed polar lows (Fig. 2). This work was supported by the Russian Foundation for Basic Research (15-35-21061, 16-55-10039, 14-05-00518 and 16-35-60078).

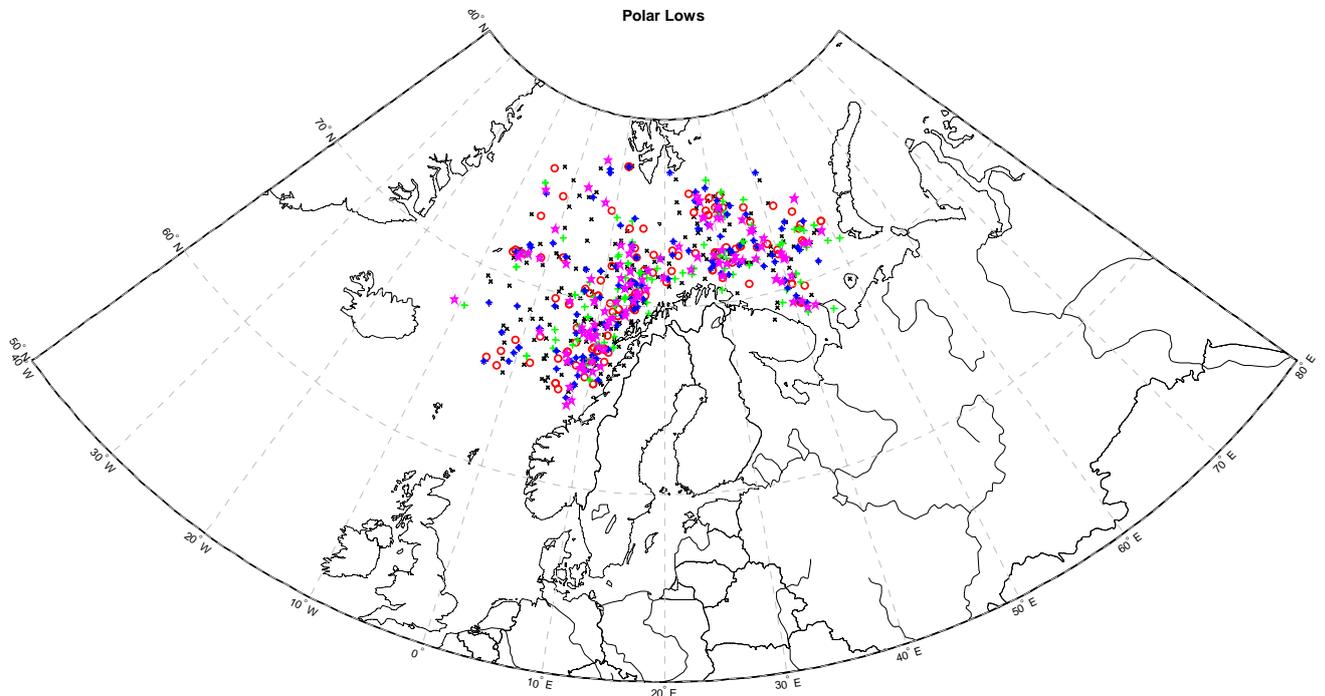


Fig. 1 Spatial distribution of polar lows in 2002-2008 according to satellite data (X) and reanalyses (ERA – “O”, ASR – “+”, MERRA – “*”, CFSR – “◇”)

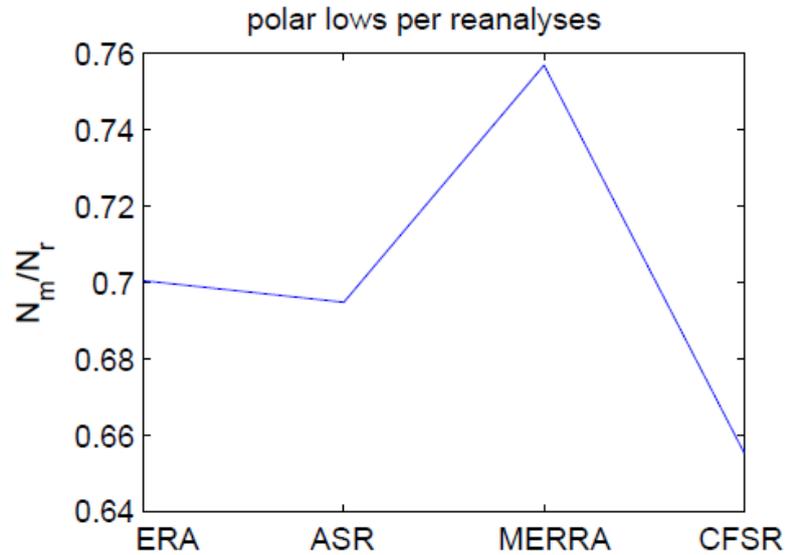


Fig. 2 The ratio of the number of polar lows over Nordic seas from reanalyses (N_m) and from satellite data (N_r).

References

Khon, V. C., I. I. Mokhov, M. Latif, V. A. Semenov, and W. Park (2010), Perspectives of Northern Sea Route and Northwest Passage in the twenty-first century, *Clim. Change*, **100**, 757–768, doi:10.1007/s10584-009-9683-2.

Khon, V. C., Mokhov I. I., Pogarskiy F. A., Babanin A., Dethloff K., Rinke A. and Matthes H.: 2014. Wave heights in the 21st century Arctic ocean simulated with a regional climate model. *Geophys. Res. Lett.*, **41**, 2956–61.