



Polar lows: energy and helicity dynamics

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Calculation of integral characteristics of polar lows such as energy and helicity together with analysis of the global helicity fields in the atmospheric boundary layer according to ERA-Interim re-analysis data for the high latitudes of the Northern Hemisphere has been made. Comparison between ERA-Interim re-analysis data, WRF-ARW model results (version 3.7.1) and experimental data has been carried out.

It was demonstrated that the local variations of helicity are adjacent to the frontal part of a polar low. The helicity applicability as the both diagnostic and prognostic tool has been investigated for polar lows observed over the Norwegian Sea and the Barents Sea in the period between 27 and 31 March, 2013. At a time of polar lows activity, from 27.03.2013 to 31.03.2013, the local minima of the integral helicity align with the local maxima of the geopotential field. In the period of the polar lows genesis the integral helicity increases. During the polar lows occlusion, as from 29.03.2013 to 30.03.2013, the helicity decreases due to the slowing down of the rotational motion when the polar lows boundaries expand.

There is a good correlation between the integral helicity and the square of the wind velocity at the higher sounding levels (400-800 m) in slightly unstable or neutral stratification conditions. This fact allows using the geostrophic wind data to build the regional and global helicity fields.

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