



An objective global climatology of polar lows based on reanalysis data

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Here an objective global climatology of polar lows has been developed. In order to obtain objective detection criteria the efficacy of several parameters for separating polar lows from other cyclones has been compared. The comparison and the climatology are based on the ERA-Interim reanalysis from 1979 - 2016 and the higher resolution Arctic System Reanalysis from 2000 - 2012.

The parameters found to be the most effective at separating polar lows subjectively identified by experts from all other kinds of synoptic and meso-scale cyclones were the difference between the mean sea-level pressure of the low and its surroundings, the difference in the potential temperature between the sea surface and the 500 hPa level, and the tropopause wind poleward of the system. Other parameters often used to identify polar lows, such as the 10 m wind speed and the temperature difference between the sea surface and the 700 hPa level were found to be less effective.

Investigation of the climatologies reveals that polar lows occur in all maritime basins at high latitudes, but with high density in the vicinity of the sea-ice edge and coastal zones. The regions showing the highest degree of polar-low activity are the Denmark Strait and the Nordic Seas, especially for the most intense polar lows. In the North Atlantic and Pacific the main polar-low season ranges from November to March. In the Southern Hemisphere polar lows are mainly detected between 50 - 65S from April to October, indicating that this hemisphere compared to its northern counterpart has a two months longer, but less intense, polar-low season. No significant hemispheric long-term trends are observed, although some regions, such as the Denmark Strait and the Nordic Sea experience significant downward and upward trends in polar lows, respectively, over the last decades. For intense polar lows a significant decaying trend has been observed for the Northern Hemisphere.