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A NEW CLIMATOLOGY OF POLAR LOWS

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Polar lows are an intense subset of mesoscale weather systems that occur during cold-air outbreaks over relatively warm oceans. There is evidence to suggest the such mesoscale weather systems interact with the sea ice edge and may influence ocean circulation. However, to date climatologies of polar lows have largely been based on classification schemes defined in terms of cyclone structure as viewed from satellite imagery. Without quantifiable parameters, the systematic application of such schemes is difficult and subjective. Due to improving model capabilities, a current area of active research is based around the objective identification of polar lows in model data. The purpose of this study was to compile the first objectively defined climatology of polar lows, from which their statistics of occurrence and characteristics of the environments in which they form could be assessed.

The method employed was to form the climatology using numerical weather prediction (NWP) model data. More precisely, polar low activity was assessed in the Nordic seas region of the extreme north-east Atlantic from a five-year database of cyclones objectively identified in the UK Met Office Unified Model.

The results from an analysis of polar lows in the Nordic seas show that: (i) the objective climatology agrees well with subjective methods of satellite imagery analysis and (ii) the environment in which polar lows occur varies significantly according to location, with weak convection and strong baroclinicity along the marginal ice zone and more convective polar lows away from the ice edge.

An important aspect of this study is that such an approach could potentially be used to assess the climatological behaviour of polar lows that occur in the vicinity of Antarctica. The new method allows polar lows to be identified in an objective and systematic manner, which will allow for long-term trends in activity related to climate change and links to large-scale weather patterns to be assessed.