Geophysical Research Abstracts
Vol. 20, EGU2018-6488, 2018
EGU General Assembly 2018

Forecast verification of summertime Arctic cyclones on medium-range timescales

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Arctic cyclones (ACs) are a severe atmospheric phenomenon that affects the Arctic environment. As the Northern Sea Route has become more accessible due to the recent loss of sea ice, planning of ship routes requires accurate prediction of ACs, particularly their positions. This study assesses the forecast skill for 10 extraordinary ACs in summer (June – August) of 2008–2016 using 5 leading operational medium-range ensemble forecasts: the Canadian Meteorological Centre (CMC), the European Centre for Medium-range Weather Forecasts (ECMWF), the Japan Meteorological Agency (JMA), the US National Centers for Environmental Prediction (NCEP), and the UK Met Office (UKMO). Average existence probability of the predicted ACs was >0.9 at lead times of $\leq$3.5 days. Average central position error probability of the predicted ACs was less than half of the mean radius of the 10 ACs (469.1 km) at lead times of 2.5–4.5 days. Average central pressure error of the predicted ACs was 5.5–10.7 hPa at such lead times. Therefore, the operational ensemble prediction systems generally predict the position of ACs within 469.1 km 2.5–4.5 days before they mature. Overall, ECMWF exhibits a 1-day advantage in predicting the existence, central pressure, and central position of the ACs, compared with the other centers. The second-best performing center was dependent on the forecast lead time and the AC event. The forecast skill for the extraordinary ACs is lower than that for mid-latitude cyclones in the Northern Hemisphere, but similar to that in the Southern Hemisphere. The sparse network of observations over both the Arctic and Southern Hemisphere and the consequential analysis uncertainties in initial conditions are presumably the reasons for the similarity in forecast skills.