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An extreme Arctic cyclone in August 2016 and its predictability on medium-range timescales

Akio Yamagami (1), Mio Matsueda (1,2), and Hiroshi Tanaka (1)

(1) Center for Computational Sciences, University of Tsukuba, Tsukuba, Japan (yamagami@ccs.tsukuba.ac.jp), (2) Department of Physics, University of Oxford, Oxford, UK

An extremely strong Arctic cyclone (AC) developed in August 2016. The AC exhibited a minimum sea level pressure (SLP) of 967.2 hPa and covered the entire Pacific sector of the Arctic Ocean at 0000UTC on 16 August. At this time the AC was comparable to the strong AC observed in August 2012, in terms of horizontal extent, position, and intensity as measured by SLP. Two processes contributed to the explosive development of the AC: growth due to baroclinic instability, similar to extratropical cyclones, during the early part of the development stage, and later nonlinear development via the merging of upper warm cores. The AC was maintained for more than one month through multiple mergings with cyclones both generated in the Arctic and migrating northward from lower latitudes, as a result of the high cyclone activity in summer 2016.

This study also investigated the predictability of the AC using operational medium-range ensemble forecasts: CMC (Canada), ECMWF (EU), JMA (Japan), NCEP (USA), and UKMO (UK), available at the The Interactive Grand Global Ensemble (TIGGE) database. The minimum SLP of the AC at 0000UTC on 16 August was well predicted by ECMWF 6-day, NCEP and UKMO 5-day, CMC 4-day, and JMA 3-day in advance. The predictability of the minimum SLP of the AC in August 2016 was much higher than that of the AC in 2012 August. Whereas most of the members well predicted the cyclogenesis of the AC, the growth due to baroclinic instability was weaker in some members. Even if the baroclinic growth was predicted well, predicted AC did not develop when the nonlinear development via the merging was not predict accurately. The accurate prediction of the processes in both early and later parts of the development stage was important for the accurate prediction of the development of the AC.