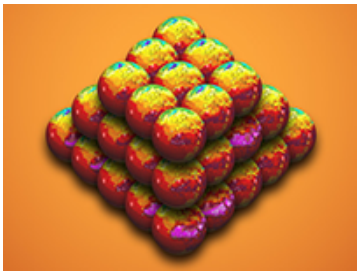

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Assessing the impact of horizontal and vertical resolutions on prediction of Arctic cyclone using the OpenIFS ensemble predictions

Arctic cyclones (ACs) are low pressure systems that develop in the Arctic region. ACs developed in summer have a long lifetime and wander around the North Pole. In this study, we investigated the impact of horizontal and vertical resolutions on prediction of 13 ACs occurred in summer (June–August) from 2008 to 2018, using an ECMWF OpenIFS model. We conducted 11-member ensemble predictions for three different horizontal resolutions (T255, T511, and T1023) with a fixed vertical resolution (L137). For the low-resolution (T255) model, 10-member ensemble predictions for three different vertical resolutions (L60, L91, and L137) were also conducted. The results show that forecast skill of spatial patterns of mean sea level pressure (SLP) are highly sensitive to the horizontal resolution of the model. The high-resolution (T1023) model showed the highest spatial correlation coefficients (SCC) of SLP in the Arctic region (70°–90°N) for most of the AC events. Averaged SCC for the high-resolution model was kept over 0.6 up to lead times of +7.5 days, whereas those for the lower-resolution models dropped below 0.6 at lead times of +7 days. It is also found that the vertical resolution of the model has (little or large, under verification) impact on the forecast skill of ACs. The forecast skill of the ACs can be improved with the increase in the horizontal resolution of the model, in spite that atmospheric energy is spectrally truncated at lower resolution in initial states.

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