

B02-O10

IMPACT OF RADIOSONDE OBSERVATION ON A SUMMERTIME ARCTIC CYCLONE FORMATION FORECAST

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Impact of Arctic radiosonde observations on forecast of the ‘strongest’ early-August 2012 arctic cyclone of all August is investigated through an observing system experiment (OSE). An atmospheric ensemble reanalysis (ALERA2) is used as the control experiment (CTL) which can reproduce development of the Arctic cyclone and large-scale fields surrounding it. The OSE is the same reanalysis as the CTL except that radiosonde observations from the Germany icebreaker *Polarstern* that cruised near Svalbard during mid July to early August 2012 are excluded.

Comparing the two reanalyses, the upper tropospheric circulations over the north of mid Eurasia are different just before the Arctic cyclone develops; in the CTL, a tropopause polar vortex over there is stronger than that in the OSE. This indicates that the upper-level field in the OSE has less potential for baroclinic instability over the mid Eurasia.

Ensemble predictions are then conducted by using the two reanalyses as initial values when the polar vortex approaches to the north of mid Eurasia. The prediction from the CTL can reproduce the development of the Arctic cyclone, while that from the OSE cannot. Moreover, relative contribution of upper-level reproductivity with lower-level one for the formation forecast of the Arctic cyclone is evaluated by suppressing potential-vorticity difference between the CTL and the OSE from the initial value of the CTL prediction. It was found that the development heavily depends on the upper-level circulation.

The result indicates that reproduction of the upper-level atmospheric circulation in the Arctic region is indispensable for the prediction of the Arctic cyclone, which originates from the extra radiosonde observations. In particular, despite the observations are taken far from the Arctic cyclone, they remotely affect the prediction of the cyclone via the upper tropospheric circulation in the west wind drifts.