An Analysis of the Intense Arctic Cyclone of August 2012

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ABSTRACT

On 03 August 2012, a cyclone formed over Central Siberia and progressed northeastwards. By 0000 UTC 05 August, the cyclone reached the Arctic Ocean with a mean sea-level pressure (MSLP) of 984 hPa. Once over the Arctic Ocean, the cyclone rapidly intensified and reached a minimum pressure of 962 hPa on 06 August near 83°N and 170°W. The cyclone slowly weakened, and on 0000 UTC 10 August once again had a minimum MSLP of 984 hPa. The motivation for this presentation is driven by the likelihood that this cyclone is one of the most intense storm systems to ever impact the Arctic Ocean in the modern data era. The rarity of this storm is further supported by the fact that it occurred during the summer, prior to the climatologically favored more intense cyclone-season of the fall. The purpose of this presentation will be to present the results of a climatological analysis of Arctic Ocean cyclones between July and October for 1979 to 2012. We will conduct a diagnostic analysis of the intense cyclone of early August 2012 to help place it within the context of this Arctic cyclone climatology.

Prior to development, there existed an anomalously strong baroclinic zone at 850 hPa over north-central Russia. The corresponding 850 hPa temperature anomalies were between -2°C and -4°C poleward of 70°N and upwards of +8-9 °C over eastern Russia near 60°N. This enhanced baroclinicity aided in developing an anomalously strong 300 hPa polar jet along the coast of northeastern Russia (20-25 m s^{-1}) that helped to intensify the cyclone. Noteworthy, the most rapid intensification occurred as the cyclone traversed the ice-free waters of the Arctic Ocean. How much of an influence latent and sensible heat fluxes had in destabilizing the lower atmosphere will be discussed during this presentation. The intense cyclone of early August 2012 featured very warm air at 850 hPa (> 15 C) collocated with high values of precipitable water (> 35 mm) within the warm-sector of the storm poleward of 70°N. These anomalously high temperature and moisture anomalies were indicative of the strength of the warm-air advection, as well as the overall strength of this cyclone. An attempt will be made to distinguish between the influence that the thermodynamical forcings had on intensifying the cyclone as compared to the aforementioned synoptic-scale dynamical forcing.