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A STUDY ON THE CYCLOGENESIS OF THE ARCTIC CYCLONE FROM THE PERSPECTIVE OF QUASI-GEOSTROPHIC POTENTIAL VORTICITY

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In this study, we investigated the cyclogenesis of the Arctic cyclone from the perspective of quasi-geostrophic potential vorticity as case studies, using 6-hourly reanalysis data of Climate Forecast System Version 2 (CFSv2) on a 0.5° horizontal grid provided by the National Centers for Environmental Prediction. In resent years, the sea-ice extent has been extraordinary reduced over the Arctic ocean due to the global warming. Accordingly, the frequency of the appearance of intensified Arctic cyclones has increased since 1990s. Since some of them accompanies a large-scale cyclonic flow with a width more than 1000 kilometers and have a long-life time, their impacts on the climate field are especially large not only in the Arctic region, but also in the mid-latitudes. In order to understand the thermodynamic and dynamic structure of an Arctic cyclone, R/V Mirai conducted a cruise in Chukchi and Beaufort Seas in September 2014. It includes a stationary observation during a period of 6-25 September at 74.75°N, 162.00°W. In this period, 3-hourly insensitive radiosonde observations were made with a Vaisala radiosonde (RS92-SGPD). Figure 1 shows the time-height cross-section of air temperature and wind observed by radiosondes. In order to examine the source of vortices of the cyclone, we also calculated quasi-geostrophic potential vorticity by using the reanalysis data (not shown). It was implied that the Arctic cyclones have a different structure compered with the mid-latitude cyclones.

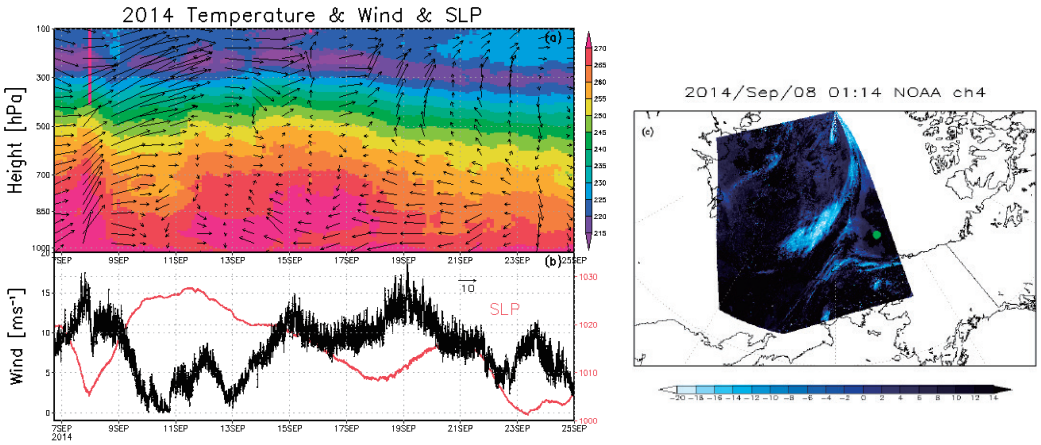

Figure 1. Observed time-height cross-section of (a) air temperature (b) surface wind and sea level pressure (c) NOAA/AVHRR infrared image on 8 September at 0114 UTC