

Dynamics and Statistics of Arctic Cyclones Compared with Tropical and Extra-tropical Cyclones

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The dynamics and statistical analysis of Arctic cyclones in the summer period (JJA) of 2005-2008 are examined using the JCDAS data. The frequency of the cyclone tracks, the vertical structure of the vortex tube, air temperature, wind and the characteristic features of the life cycle of the cyclones are investigated. These factors are compared with the extratropical cyclones that are excited by baroclinic instability and a tropical cyclone (Hurricane KATRINA in 2005) which are excited by the conditional instability of the second kind (CISK). The Arctic cyclone displayed several interesting characteristics; their life cycles are long (maximum: 27.75 days, five cases of the Arctic Cyclones average: 20.85 days, all cyclones average: 2.3 days) and the direction of movement of the cyclones are random.

Furthermore, the cyclones exhibit a barotropic structure and are observed just below the polar vortices at the 500 hPa height field. The vertical structure of the vertical p -velocity also indicates the distribution of the updraft at the cyclone center and the downdraft above the 200 hPa height. The distribution and the vertical structure of air temperature at 200 hPa height shows the presence of a warm core. Thus, the Arctic cyclones have several interesting characteristics and are assumed to be created due to the warm core in the stratosphere; the warm core are formed as a result of the downdraft with adiabatic compressive heating from the upper levels of the stratosphere.