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Climatology of explosively developing extratropical cyclones over the Kurosio Front

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When the East Asian winter monsoon is strong, the explosive cyclone activity tends to concentrate in the Kurosio Current(Yoshiike and Kawamura,2009). It is important to understand the relationship between the heat supply from the Kurosio extension region and the development process of cyclones. The purpose of this research is to reveal meteorological and oceanic environments that can provide deferences of the cyclone path or the rapid development.

Composite analysis for cyclones developed over the westerly(TypeW_P) or easterly(TypeE_P) Kurosio extension region was conducted. The Result suggests the existence of mesoscale circulation over the Sea of Japan is important to northwardly path of the TypeW_P cyclone. In addition, before the maximum deepning of the TypeW_P cyclone, latant heat flux clearly increased at the Kurosio extention region. It was result of easterly winds, to blow in front of a warm front of cyclone. The Kurosio extension region, which was meander north and south direction, responded to the winds. These results not appear in composite analysis for the TypeE_P cyclone. The influence on weather of Kanto region are also investegated. the results show the TypeW_P cyclone tend to provide heavy rain or snow, and the TypeE_P cyclones provide severe winds on that region. These results show the important contribution of water vapour provided from the Kurosio extension region to the TypeW_P cyclone. We conducted more composite analysis for that cyclones. Composite analysis at the cyclone center revealed some difference in advection of water vapour. The water vapor flux, blow from southeast quadrant to cyclone center, was more stronger in the TypeE_P, but The precipitable water that extend to south of cyclones was greater in the TypeW_P. As the result of strong water vapor advection, development of the TypeE_P cyclone was assisted. On the other hand, more humidity air masses cotributed to development of the TypeW_P cyclone. These experiments were conducted for cyclones that developed over the westerly or Easterly Subarctic frontal zone of the northwstern Atrantic(TypeW_A and TypeE_A, respectively). But no clear difference appeared in low-level environment associated with the TypeW_A or the TypeE_A cyclone. These results suggests that the deferences of low-level fields associated with the difference of the maximum deepning position are particular phenomenon in the Kurosio extention resion. In addition, the contribution of water vapour advection to the cyclone center was stronger for cyclones developed over the kurosio extension region.

Keywords: Explosively developing extratropical cyclone, East Asian winter monsoon