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Analyses of a Polar Low Case in the East Coast of the Korean Peninsula using High-resolution WRF Model Simulation

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The polar low event, which is occurred in the Korean Peninsula on 15 March 2019, is investigated focused on eastern regions of the Korean Peninsula (Kangwon Province). The polar low is developed by advected stratospheric air caused by the tropopause folding. Advected cold air increases potential vorticity in mid-level and induces cyclonic vorticity and convergence in low-level. It caused snowfall of 18 cm in a mountain area and rainfall of 18.5 mm in a coastal area of Kangwon Province. It is difficult to forecast the weather of this region because of the complex meteorological phenomena which are caused by the complicated valleys in the western part and the East Sea/Sea of Japan in the eastern part. Therefore, in addition to synoptic analysis, a detailed analysis is required in consideration of mountain and valley breeze, land-sea breeze, and topography.

In this study, we analyze synoptic, thermodynamic, and dynamic characteristics of this case using high-resolution simulation from the Weather Research and Forecasting (WRF) Model. Domain 1 covers East Asia with 25 km resolution to capture synoptic phenomena. Domain 2 covers the Korean Peninsula with 5 km resolution to capture the development of low pressure and its movement. Domain 3 covers eastern regions of the Korean Peninsula with 1 km resolution to analyze a distribution of precipitation. Especially, we more focus on an analysis of vertical and horizontal wind field to analyze a combination of easterly caused by low pressure and westerly caused by the land breeze and how it affects local precipitation.