Simulation of Snowstorm over the Yellow Sea using a Mesoscale Coupled Model

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Ocean effect snowstorms occur during the passage of a cold continental polar air mass over warmer ocean waters has been generally understood for decades. Ocean effect snowstorm can be considered a kind of lake-effect snowstorm (Waldstreicher, 2002). Every winter, the Korean Peninsula is frequently affected by cold air outbreaks which induced by strong northwesterly winds during the extension of the Siberian high. This study aims to examine the favorable conditions for the ocean effect snowstorm across the Yellow Sea over the southwestern coast of Korea on 21 December 2005, using a coupled model with a Coupled Ocean/Atmosphere Mesoscale Prediction System as the atmospheric component and the Regional Ocean Modeling System as the oceanic component. Simulation of heavy snowfall event, which was 44.3 cm of snow accumulated in 24-hour, was performed to investigate the mesoscale structure, dynamics and development mechanism in the snowstorm.

As a result from 48-hour integration, the results of simulation showed that surface diabatic heating and barotropic instability played important roles in the formation of snowstorm. The enhanced surface diabatic heating was dominant in the latent heat flux, and eventually induced convective instability. Additional factor was the favorable condition of synoptic environment, accessing the cold air transport by the approach of the upper-level cold vortex over the warm ocean. Besides these factors, conditional symmetric instability (CSI) is a mechanism which can result in a heavy snowfall with sufficient moisture and upward vertical motion. A slantwise convection, which can result in banded heavy snowfall that cannot be explained through normal synoptic scale vertical motion processes (McCann, 1995), created in the area of CSI could cause the snowstorm to develop.
Keywords : ocean effect snowstorm, surface diabatic heating, barotropic instability, convective instability, conditional symmetric instability

References

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