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Severe downslope windstorms of Gangneung in the springtime

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92 severe wind cases of Gangneung were selected for the winds of which maximum instantaneous speeds exceed total mean + 2 standard deviation, and corresponding Osan soundings were categorized based on previous theories. As a result, partial reflection was found to be the most frequent mechanism for the last 30 years. To understand the role of inversion in generating downslope windstorm, horizontal velocity perturbation was calculated analytically for the atmosphere with an inversion. It turned out that the intensity of downslope wind was increased by inversion of specific heights.

The ARPS model was employed for the 2-dimensional numerical simulation study of the severe downslope windstorms. In most cases, severe downslope windstorm and its mechanism reproduced well, although numerical calculation tended to overestimate the surface wind speed due to ignoring the flow splitting effect in the present 2-dimensional framework. The 3-dimesional WRF model was used to analyze the severe downslope windstorm using the case of April 5, 2005. Two strong wind periods of Gangneung were reproduced and it was found that severe winds for period I and II were formed by critical-level reflection and hydraulic jump mechanism, respectively. Sensitivity tests were performed with respect to initial data (FNL, RDAPS) and planetary boundary layer parameterization schemes (YSU, MYJ, without PBL scheme). It was found that simulated wind speed using RDAPS initial data became more close to the observed wind speed than that using FNL initial data. In addition, the influence of PBL was investigated in terms of mountain wave absorption to understand its role of decreasing the intensity of downslope wind. The maximum instantaneous wind speed events occurred more frequently during daytime when heat flux increased because the

PBL absorbs mountain wave better as heat flux decreases.