

Numerical Simulations on the Downslop Windstorms and  
Lee-side Eddies Influenced upon the Concentration of SO<sub>2</sub>  
in the Coastal Mountain Areas

연안 산악지역에서 이황산가스의 농도에 영향을 주는  
하강폭풍과 풍하소용돌이에 관한 수치모의실험

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### 1. Introduction

In the last two decades Smith(1978), Davies(1987) and Shutts(1992) carried out the thoretical and numerical studies on the surface pressure drag and wave momentum flux in the mountain ranges. Bougeault et al.(1993), Peltier and Clark(1979), Durran and Klemp(1987), Smolarkiewicz and Rotunno(1989), and Smith(1989) made numerical simulations on orographic effects such as downslope winds, lee-side waves and up-stream blocking.

The further research on the dynamical effects of meso-scale mountains in the large scale numerical models of the atmosphere have been given by Palmer et al.(1986). However, even if orographic effects still remain as quantitatively unsolved problem due to their comlexity, they act as an important roll to improvements of numerical forecasting of meso and large scale atmospheric motions(Bougeault et al, 1993).

### 2. Data analysis and numerical method

A non-hydrostatic numerical model was used for the structure of winds from the surface to 4000m height at 15 levels in Z\* coordiate on the complex terrain by using the G-ANL data during the period of March 26 through 28, 1994. we used a non-hydrostatic grid-point numerical model with one way double nesting technique. The horizontal resolution of the model with grid intervals of 7km and 14km for the fine-mesh and the coarse-mesh models by double nesting technique

In the coarse-mesh and fine-mesh models, lateral boundary data are provided with 12 hourly G-ANL data (global analysis) made by Japan Meteorological Agency. Initial fields such as winds, potential temperature, specific humidity were used for all two models with different resoultions. Initial temperatures of sea surface water obtained by NOAA satellite were also used for the numerical simulations.

### 3. Result

During the period of the prevailing of synoptic scale westly wind in the Korea penninsula the micro-scale downslop windstorms were created in the lee-side Taeback mountains near Kangnung city, inducing a strong hydrolic jump of air flow, which can induce an inertial instability and drive the potential energy into the kinetic energy were detected in the lee-sides of mountains, and its bounding near the lee-side bottom of the mountain. On the other hand, the meso-scale sea breeze cycle or cell was also near the surface with the complexity at this time. The foehn effect started during the night on the eastern side of the mountain range, consecutive to the increase in the synoptic wind. The fohn onset may be seen spectacularly in the temperature and humidity sequences from top of the mountain to the bottom in the lee-side. In the mountains area where neither special upper level nor spatial observation points exist, it is more adequate to use numerical models in order to find out mountain effects, when the strong surface winds existed in the Kangnung mountain and coastal regions. Under this kind of weather situations the concentration of atmospheric pollutants should be changed compare to their concentrations under the usual moderate winds, thus, we analysis the spartial and temporal variations of their concentrations.

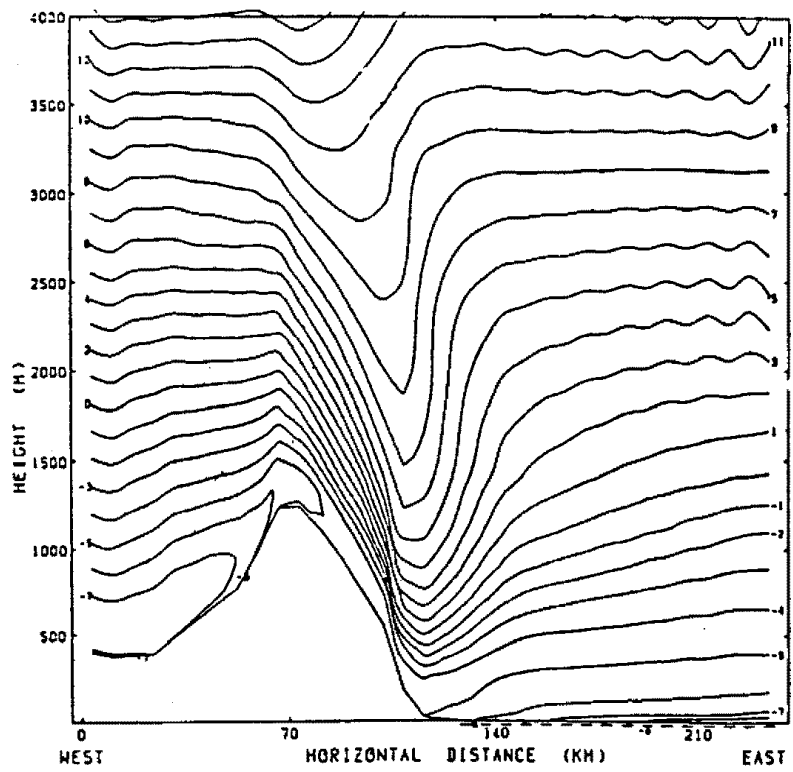
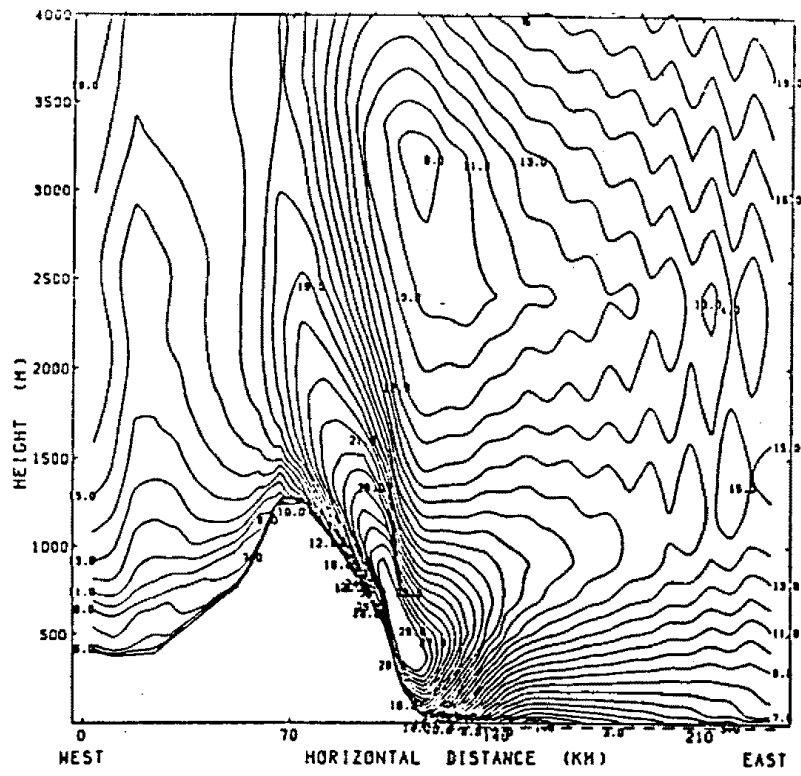


Fig. 8-2. As shown in Fig.1-2 except for 09 LST, March 28, 1994.