Growth and Recession of Thermal Internal Boundary Layers at the Cheju Coastal Site

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The study area is located at the beach sites of the eastern edge of Cheju island(Songsan-po) in ths South of Korea and consists of flat and homogenous terrain with sand in the surf zone and short grass growing further inland with complex terrain(Choi and Choi, 1994). In order to investigate the growth of internal boundary layer in Cheju island from December 25, 1986 through 26 for 24 hours, we used a non-hydrostatic grid-point model with one-way double-nesting. The authors increased the horizontal resolution of the model with grid intervals of 5km and 1.5km at 33^0N for the finest-mesh and the coarse-mesh model in making a modification for double nesting in order to simulate extensively internal boundary layer phenomena. Vertical resolution is also increased with the number of 15 levels in Z^* coordinate.

In the coarsest-mesh model, lateral boundary data are provided with 12 hourly G-ANL data(global analyses) made by Japan Meteorological Agency. The prediction of the model made lateral boundary data for the finest-mesh model, and horizontal and vertical interpolations of the same global analysis data made initial fields such as winds, potential temperature, specific humidity for all two models with different resolutions. Initial temperatures of sea surface water were obtained from sea surface temperature data acquired by NOAA satellite, which were analyzed by National Fisheries Rsearch an Development Agency(NFRDA, 1994).

24 hour prediction experiment from an initial field at 09 LST, December 25 to the next day at 09 LST, December 26 was carried out by HITACH super computer. The growth of the internal boundary layer usually affected by the surface roughness of complex terrain, land and sea surface temperatures, solar and long wave radiation and topography, etc.. According to our numerical simulation the growth of thermal internal boundary layer took a place during daytime, while the recession of internal boundary layer started after the sunset time, showing the disapperance of internal boundary layer at night.

The depth of internal boundary layer is deeper near coastal mountain sites than near the top of mountain, partly due to the surpress by the downslope and back flows. From the numerical simulation we may conclude that the area with a large vertical change of diffusion coefficients well matched the region to form thermal internal boundary layer.