Numerical Simulation Study On Atmospheric Boundary Layer Characteristics In Taipei Basin Under Northeast Monsoon Conditions

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In winter, the variation of the northeast monsoon intensity will not only cause significant differences in water vapor flux flowing into the Taipei Basin but will also affect the characteristics of the atmospheric boundary layer, resulting in changes in air quality. Because the Taipei Basin is affected by the terrain, it is difficult to dissipate heat. The heat island effect is more obvious in winter than in summer. This situation is also true compared to other cities in northern Taiwan. To understand the characteristics of the atmospheric boundary layer in the Taipei Basin under northeast monsoon conditions. This study uses the WRF (Weather Research and Forecasting Model) model with a four-layer nested grid and a high spatial resolution of 500 m to simulate the diurnal variation in the atmospheric boundary layer in the Taipei Basin on November 26, 2021. The results found that the wind direction in the Taipei Basin that day was mostly easterly, and there was continuous precipitation in both the northern and southern parts of the Taipei Basin. During the day, the surface temperature in downtown Taipei was higher and the turbulence in the mixing layer was more obvious than in the suburbs. The height of the urban mixed layer was deeper than that of neighboring suburbs, and the city cools more slowly at night than the suburbs, making the heat island effect more obvious at night than. The height of the atmospheric mixing layer in the Taipei Basin averaged below 1,000 m, and the air quality was good except during commuting hours. Taking the Sanchong and Banqiao areas of New Taipei City as the center of the concentric circles, the temperature at 2 m above the ground and mixing layer height are the highest and gradually decrease outward. Affected by the northeast monsoon and local rainfall, the simulated temperature at 2 m above the ground between Taipei city center and suburbs didn’ t exceed 2˚C, and the mixed layer height difference was about 25 m.

Keywords: Northeast Monsoon, Taipei Basin, Atmospheric Boundary Layer, Heat Island Effect

