

The effects of synoptical weather pattern and complex terrain on the formation of aerosol events in the Greater Taipei area

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摘要.

The aerosol in the Taipei basin is difficult to transport outward under specific weather patterns owing to complex terrain blocking. In this study, seven weather patterns are identified from synoptic weather maps for aerosol events, which occur-red from March 2002 to February 2005. Among the identified weather patterns, High Pressure Peripheral Circulation (HPPC), Warm area Ahead of a cold Front (WAF), TYphoon (TYP), Pacific High Pressure system stretching westerly (PHP), Weak High Pressure system (WHP), and Weak Southern Wind (WSW) are related to terrain blocking. The remaining pattern is High Pressure system Pushing (HPP). The classification of the pollution origin of the air masses shows that 15% of event days were contributed by long-range transport (LRT), 20% by local pollution (LP), and 65% by LRT/LP mix. Terrain blocking causes aerosol accumulation from high atmospheric stability and weak winds occurring under HPPC, TYP, and PHP weather patterns when the Taipei basin is situated on the lee side of the Snow Mountains Chain (SMC). Terrain blocking also occurs when the Taipei basin is situated on the upwind of SMC and Mt. Da-Twen under WAF and WSW patterns. To study the variation of aerosol properties under the mixed influence of terrain and pollution origin, we conducted a field observation simultaneously at the urban, suburban, and background sites in the Greater Taipei area from April 14 to 23, 2004. Terrain blocking plays an important role in aerosol accumulation in the stagnant environment when the Taipei basin is on the lee side of SMC. On the other hand, the PM_{2.5} sulfate level is stable with a fraction of 30% in PM_{2.5} during the observation period at the urban (25%-33%) and background (25%-41%) sites. It indicates that background PM_{2.5} sulfate is high on the West Pacific in winter. (C) 2008 Elsevier B.V. All rights reserved.