Influence of Synoptic Pattern and Low-Level Wind Speed on Intensity and Diurnal Variations of Orographic Convection in Summer over Pearl River Delta, South China

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Based on five years of operational Doppler radar data, the influences of atmospheric synoptic patterns and low-level prevailing wind speed on the intensity and diurnal variations of summer orographic convection occurrence frequencies over Pearl River Delta (PRD), South China have been investigated. Results show that the inland orographic convection and rainfall generally occurs under synoptic pattern characterized with the prevailing southwesterly wind within the lower troposphere. The summer orographic convection over the mountains in northeastern PRD is not only controlled by the orographic thermal conditions but also the dynamic forcing with the increase of wind speed. Owing to the strong windward mechanical lifting and moisture transport associated with the strong ambient onshore winds, the number of convection occurrences characterized by a dominant diurnal afternoon peak occurs much more frequently in the high-wind-speed days. While due to the weak orographic mechanical lifting and moisture supply in the low-wind-speed days, the number of convection occurrences in the afternoon decreases considerably and two comparable peaks occur in the afternoon and early morning. The nighttime peak in the low-wind-speed days is mainly attributed to the nocturnal acceleration of the low-level southwesterly wind associated with the inertial oscillation and the corresponded enhanced windward lifting effects.

Keywords: radar climatology, synoptic patterns, diurnal variations, orographic convection