Characteristics of **Low-level Jets** in *Tianjin* with a Wind Profile Radar during 2015-2016

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Low-level jets (LLJ) are important mesoscale weather system. In this study, the characteristics of the LLJs are studied. The data are collected at a standard weather station Xiqing (54527) operated by the China Meteorological Administration from 2015 to 2016. Based on previous criteria for LLJs given by Bonner (1968) and Wei et al. (2013), a new set of criteria suitable for LLJs over NCP is defined in this study. LLJs were classified into five categories based on two criteria of the Vmax threshold value and difference value (ΔV) from Vmax upward to the adjacent Vmin. The definition are as follows. The criteria of LLJ0 are 6 m/s > Vmax ≧ 4 m/s and ΔV ≧ 2 m/s , and those of LLJ1, LLJ2, LLJ3, and LLJ4 are 10 m/s > Vmax ≧ 6 m/s and ΔV ≧ 3 m/s, 14 m/s > Vmax ≧ 10 m/s and ΔV ≧ 5 m/s, 20 m/s > Vmax ≧ 14 m/s and ΔV ≧ 7 m/s, and Vmax ≧ 20 m/s and ΔV ≧ 10 m/s , respectively. Based on the above criteria, LLJs observed at Xiqing were identified, and the number of 1-h LLJ periods was counted regardless of whether they were continuous or intermittent in the time series. Statistics showed that the most frequently directions of LLJs are 180˚–270˚, which accounted for nearly 47 %. The results of four seasons also verify the same conclusion, except the distribution of occurrence direction in winter. Moreover, compared with the relatively uniform distributions of wind directions of weak LLJs (LL0, LL1, and LL2), the distributions of wind directions of strong LLJs (LL3 and LL4) concentrate in a narrow range between 210˚ and 250˚, which suggests that southwesterly winds contribute to the formation of strong LLJs. The wind speeds of most of LLJs are less than 14 m/s, and the occurrence proportion of LLJ4 is only 5.1 %, which indicates that the super-strong LLJs is rare. The occurrence height distribution of LLJs that most LLJs occur below 2000 m, and the height distribution of LLJs is relatively uniform except the peak at lower levels (500-600 m), which can also be observed in different seasons. Moreover, compared with strong LLJs (LL3 and LL4), LL0 tended to occur at a higher level, however, the height distribution of different strength LLJs are different in four seasons. The result of monthly distribution of the frequency of LLJ occurrence shows that LLJs occur more frequently during warm season than cold season, which maybe because of the increasing amplitude of inertial oscillations in the boundary layer during the warm seasons. In addition, distribution of the frequency of LLJ occurrence display a unimodal distribution, with strong LLJs occur more frequently in spring (March to May), and the occurrence of weak LLJs concentrated in summer (June to August). In addition, it is worthwhile that moderate LLJs (LLJ1 and LLJ2) are contributories to the total LLJs through the whole year. The occurrence number of LLJs has an obvious diurnal variation, with the peak of occurrence number around midnight (2300–1400 CST). Unimodal curves are commonly observed for all categories of LLJs except the super-strong LLJ4, whose distribution can be separated into two parts, a relatively high occurrence number from 1400 CST to 2200 CST and extremely low occurrence number from 0000 CST to 1300 CST. The duration of the LLJs events is usually less than 6h and the most frequent duration is 1–2h (47 %) which suggests that the LLJs are gusty events. However, it is worthwhile the duration of weak LLJs is smaller that of relatively strong LLJs, which indicates that the stronger of the strength of LLJ, the longer duration it will last.

Keywords: low level jet, wind profile radar, tianjin

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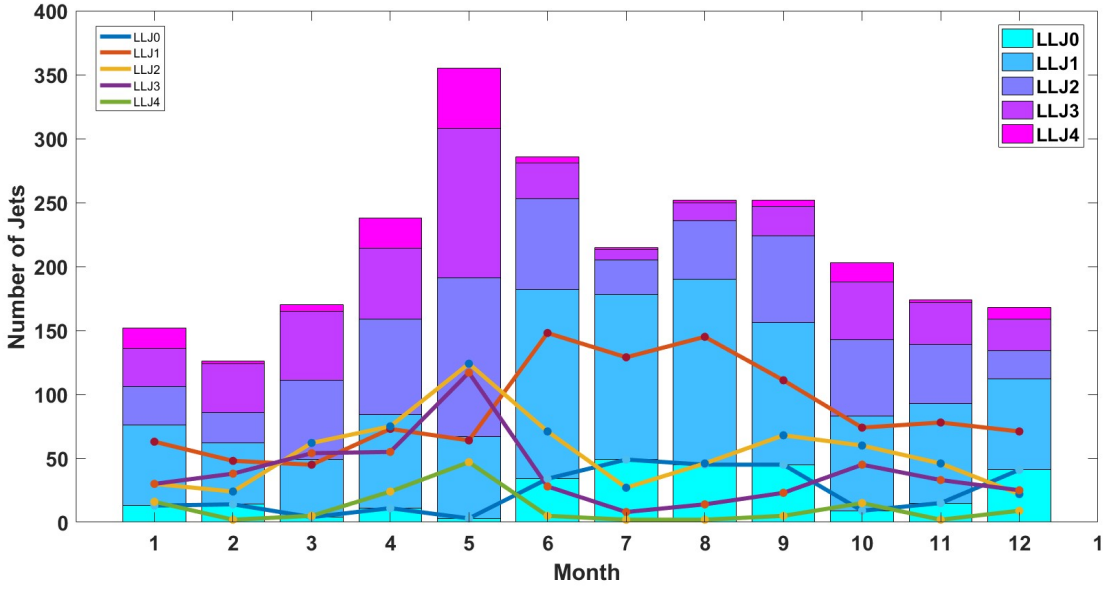

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