Geophysical Research Abstracts
Vol. 21, EGU2019-2360, 2019
EGU General Assembly 2019

High-ranging planetary boundary layer over the third Polar-Tibetan Plateau

Xuelong Chen, Yaoming Ma, and Yue Lai
Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing, China (x.chen@itpcas.ac.cn)

The planetary boundary layer (PBL) is the lowest layer of the atmosphere, which is dominated by turbulent flow. PBL turbulent process determines the exchange of heat, momentum, moisture, and chemical constituents between the surface and the free atmosphere. Recently, it was found that Extremely High PBL (EHPBL) (approximately 5 km above ground level, AGL) often happens over the Tibetan Plateau. The EHPBL facilitates exchange between the stratosphere and the boundary layer, which could influence trace gas (black carbon, POPs etc.) transporting from southern Asian to the Plateau. The underlying mechanisms responsible for EHPBL have been disclosed by using radiosonde, surface turbulent heat fluxes, and numerical data assimilation simulations. Radiosonde data indicates that the EHPBLs could happen in the Western Tibetan Plateau, and also in the Himalaya mountainous areas. Most of the EHPBLs appear in early winter or early spring. In summer, the PBL only grows “typically” 1–2 km AGL. Our results show that a EHPBL is closely associated with a deep near-neutral layer in the upper troposphere. This presentation will demonstrate the key influence of the stability of the free atmosphere upon the growth of EHPBLs over the Tibetan Plateau. The atmospheric stability in the free troposphere is influenced by jet position and downward transmission of the westerly wind. A positive feedback between the westerly wind and the EHPBL on the northern slope of the Himalaya mountain is disclosed. In conclusion, the upper level PV (potential vorticity) and westerly jet do influence the PBL development over the Tibetan Plateau.