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Characterization of Atmospheric Boundary Layer over Dibrugarh, using Pisharoty sonde and ceilometer

Abstract

The atmospheric boundary layer (ABL) is the lower part of the atmosphere, which is in continuous interaction with Earth's surface due to friction and heating or cooling. The ABL extends upward from the surface to a height that ranges from 100-3000m. The ABL is often turbulent, with a strong diurnal cycle of temperature, wind, and other factors, particularly over land and ice (Holtslag et al 2013). Over land, it varies greatly over the day, but at sea, the depth of the ABL is often a few hundred meters and rather stable over the course of a day. The study of ABL dynamics is essential for a better knowledge of the structures, characteristics, and processes under various geographical climatic and atmospheric conditions for better parameterization, as well as the interchange of ABL and free troposphere. The present study is carried out in Dibrugarh University (27.4°N, 94.8°E, 111m above mean sea level), Dibrugarh, a semi-urban area in eastern Assam, a state in north east India (NEI). Pisharoty sonde (a Radiosonde) was used for collecting upper-air meteorological observations during 2016 -2018. The use of Automatic Lidars and Ceilometers (ALC) is expanding beyond cloud base height monitoring to include the study of atmospheric boundary layer (ABL) dynamics. Present study also employed an all-weather ground-based ceilometer CL31 LIDAR with very high temporal and vertical resolution to constantly monitor the ABL over Dibrugarh beginning in April 2023. Pisharoty sonde retrieved, seasonal ABL height is maximum during pre-monsoon (1123 ± 216 m) and minimum during winter (816 ± 110 m). The Pisharoty sonde retrieved meteorological profiles are further used to derive perceptible water vapor (PWV), that varies between 0.7 cm - 2.6 cm during daytime and at night PWV varies from 0.7 cm to 2.85 cm. Ceilometer derived ABL ranges from 1.5 km - 2 km Further, these ground based measurements will be used to validate reanalysis data set retrieved ABLs.

Keywords: Atmospheric boundary layer, Pisharoty sonde, Ceilometer

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