

Study on Average Characteristics of Upper Boundary of Sodium Layer in Yanqing

YiMeng XU⁽¹⁾, ZhaoXiang LIN⁽¹⁾, GuoTao YANG⁽²⁾

⁽¹⁾ *College of Electronics and Information Engineering, South-central University For Nationalities(China), E-mail: 201521112020@mail.scuec.edu.cn*

⁽²⁾ *State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences(China), E-mail: gyang@spaceweather.ac.cn*

In this paper, data from the sodium fluorescence lidar of Beijing Yanqing (116.0°E, 40.5°N) for the night of November 2018 to December 2019 were analyzed at a spatial and temporal resolution of 1 km and 1 hour. The range of altitude that can be reached at the upper boundary of the local sodium layer, its corresponding seasonal variations, and nighttime evolution were obtained: the probabilities that the top sodium layer in Yanqing can reach 110 km, 120 km, and 130 km are 99.94 %, 84.46 %, and 40.34 %, respectively, leading to the conclusion that the top sodium layer can reach 120 km in most cases, breaking the traditional view that the top sodium layer is at 105 km (or 110 km); the seasonal pattern of the upper boundary height range is highest in May-June and lowest in February-March; the density of the top sodium layer increases in the second half of the night. We compare the correlation between the sporadic sodium layer thermosphere-ionosphere sodium layer, temperature and meteor injection with the upper boundary altitude range, and speculate that the sporadic sodium layer thermosphere-ionosphere sodium layer contributes significantly to the upper boundary expansion of the sodium layer, followed by meteor injection and the lowest temperature effect. The increased meteor injection in the latter half of the night is well correlated with the increased density of the top sodium layer at this time. By studying the ability of the top sodium layer to increase to 120 km, we can provide a theoretical basis for expanding the detection height of wind temperature.