

Continuous Detection of Diurnal Sodium Fluorescent Lidar over Beijing in China

Lifang Du⁽¹⁾, Guotao Yang⁽²⁾, Xuewu Cheng⁽³⁾, Haoran Zheng⁽⁴⁾, Yi Dong⁽⁵⁾

⁽¹⁾ State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences, China, E-mail: lfdu@nssc.ac.cn

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

⁽³⁾ State Key Laboratory of Magnetic Resonance and Atomic and Molecular Physics, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, China, E-mail: lidar@wipm.ac.cn

⁽⁴⁾ State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences, China, E-mail: hrzheng@spaceweather.ac.cn

⁽⁵⁾ State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences, China, E-mail: ydong@swl.ac.cn

Based on application of the atomic filter technology in a signal detection system of lidar, the diurnal observation of sodium lidar were obtained using the system at the National Space Science Center of the Chinese Academy of Sciences at Beijing Yanqing station (40.5 ° N, 116 ° E) in April 2014. During the lidar observation period, among the 103 cases of continuous daytime observations, the longest time was 181 h. In the case of a continuous observation period of 5 days (13–18 October 2014), the signal-to-noise ratio reached to 19:1 at 12:00–13:00 Local Time of the daytime, when the spatial and time resolutions were respectively set to 96 m of 167 s. The improvements resulted in the highest detection level of any existing diurnal lidars in China. Some interesting phenomena such as the sporadic sodium layer have also been observed during the daytime. The daytime capability extended the observing time range of the earlier systems that were limited to only nighttime observations. This innovation provides a useful method for the studies of diurnal tides, photochemistry, gravity waves, and correlative modeling studies.