R005-03
A 会場 ：11/24 PM1 （13:15-15:15）
13:45～14:00

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Variations in Na D_1 and D_2 ratio based on nightglow observations at Tromsø

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The emission layer of Na nightglow is normally located at an altitude of approximately 90 km, offering valuable insights into the atmosphere near the mesopause region. The emission mechanism of Na nightglow is well known as the Chapman mechanism. In this process, Na splits into two excited states with different energy levels, leading to the double lines in the emission spectrum: the D_1 line, 589.6 nm (in air), and the D_2 line, 589.0 nm (in air). Because the ratio branching to the two excited states is theoretically considered to be constant, the intensity ratio of the D_1 and D_2 lines (defined as R_D) is expected to be constant. However, some recent works reported that the R_D was variable (not constant) from their observations. As an interpretation for the variable R_D, a modification in the Chapman mechanism has been proposed, in which R_D can vary with the balance between reactions with O and quenching with O_2. To verify the interpretation, we need more detailed investigations based on more observations.

In this study, we conducted experimental observations of R_D using a compact spectrograph at Tromsø, Norway (69.6N, 19.2E), for approximately five months from October 2017 to March 2018. To enhance the resolution of our spectrograph, we replaced the diffraction grating of 300 G/mm with one of 1200 G/mm. The replacement resulted in an improved spectral resolution of 0.4 nm. This change resulted in an improved spectral resolution of 0.4 nm. Although this made it possible to separate the Na D_1 and D_2 lines more effectively, the separation was not perfect. To separate D_1 and D_2 lines, we performed a double-gaussian fitting in the data analysis, and subsequently obtained R_D. Additionally, we analyzed all-sky images obtained during observations to examine the weather conditions and the surrounding environment affecting the observations. Such conditions over Tromsø were determined through both manual inspection and deep learning methods. We made data selections based on the determined conditions. After that, 168-hour R_D data during the five months were obtained by the data analysis including the double-gaussian fitting. In the presentation, we will show the observed R_D variations and discuss their relationships with O and O_2 effects. In addition, we will discuss the influence of contamination in the data analysis from cosmic rays and auroral N_2 emissions.