

WIND-2: Lithium release experiment by LES onboard S-520-26 sounding rocket

Takatoshi Morinaga^{1*}, Tomohisa Yamada¹, Masa-yuki Yamamoto¹, Hiroto Habu², Shigeto Watanabe³, Takumi Abe², Mamoru Yamamoto⁴

¹Kochi University of Technology, ²Japan Aerospace Exploration Agency, ³Hokkaido University, ⁴Kyoto University

1. Introduction

WIND sounding rocket campaign was carried out at Uchinoura, Kagoshima, Japan (131.08E, 31.25N) on September 2, 2007. The purpose of WIND experiment is to obtain thermospheric neutral wind by using resonance scattering luminescence of Lithium vapor released from the rocket. In the WIND campaign, resonance scattering luminescence of Lithium was successfully imaged at both four sites simultaneously more than forty minutes, revealing thermospheric neutral wind profile up to 400 km altitude. Following to the WIND experiment, WIND-2 sounding rocket campaign with ground-based simultaneous observation is planned in 2010.

2. Experiment

The S-520-26 sounding rocket of the WIND-2 campaign is scheduled for launch from Uchinoura, Kagoshima, Japan in order to measure neutral wind profile by Lithium tracer released from the rocket like the WIND campaign. This time, the experiment is planned in the dawn condition, and an advanced-type Lithium Ejection System (LES) will be used. Because an unexpected release by the earlier LES was confirmedly imaged with three planned Lithium releases. In addition, Lithium imagers by using a 20 nm bandpass filters were improved, namely, band width was compressed into 12 nm, planning three observation sites including one main site with the both 20 and 12 nm filters.

3. Discussion

The WIND campaign was carried out under dusk condition, decreasing background light with time, i.e., elevating S/N at the same time. At the lowest end of the Lithium trail, luminescence observation was become difficult because of Lithium diffusion and variation of sunlit condition, however, the WIND-2 campaign was planned in the dawn, so that sunlit condition will be coming from top to bottom. Rapid growing of background light will affect S/N of Lithium imaging higher than that of dusk condition, however, this experiment will be a significant mile-stone for the future experiment at daytime. Due to the slow diffusion speed, Lithium luminescence in the E layer altitude will be observable for a long time. Along with the WIND's results, discussion and careful determination of precise launch time of the WIND-2 campaign would be important. In this paper, based on the results on emission intensity and S/N ratio analyses in the WIND campaign, case studies for determination of ground-based observation sites, launch time, and azimuth angle of the WIND-2 campaign will be presented.

References

Yamada, T., Yokoyama, Y., Yamamoto, M.-Y., Estimated amount of Lithium release and its emission efficiency in the WIND experiment, SGEPSS 2009, B005-28, Kanazawa, in Japanese, 2009.

Yokoyama, Y., Yamamoto, M.-Y., Watanabe, S., Abe, T., Habu, H., Ono, T., Otsuka, Y., Saito, A.,

High-accuracy analyses of thermospheric neutral wind profile by Lithium release experiment of WIND, SGEPS 2008, B005-42, Sandai, in Japanese, 2008.

Keywords: WIND-2 campaign, Lithium, thermosphere, neutral wind, resonance scattering