Lithium release experiment by LES onboard S-520-23 sounding rocket

Masa-yuki Yamamoto[1]; Yuki Yokoyama[2]; Kazuya Noguchi[1]; Hiroto Habu[3]; Yuji Ikeda[4]; Yuichi Otsuka[5]; Shigeto Watanabe[6]; Mamoru Yamamoto[7]; Takumi Abe[3]; Takayuki Ono[8]

[1] Kochi University of Technology; [2] Electronic and photonic,Kochi University of Tech; [3] ISAS/JAXA; [4] none; [5] STE-LAB, Nagoya Univ.; [6] Earth and Planetary Sci., Hokkaido Univ; [7] RISH, Kyoto Univ.; [8] Department of Astronomy and Geophysics, Tohoku Univ.

http://www.ele.kochi-tech.ac.jp/masayuki/

1. S-520-23 rocket experiment WIND

In order to measure neutral wind in thermosphere, Lithium release experiments to the altitudes of 250 km, 200 km, and 150 km is planned as a part of the next sounding rocket experiment. The S-520-23 rocket campaign called WIND is scheduled at Uchinoura Space Center in August 2007. Here we will show the current status of this experiment with S/N estimation at around 670 nm, a resonance scattering wavelength of Lithium.

2. Lithium release experiment

Neutral wind measurements by rocket-released TMA tracer at E-layer altitude were reported in SEEK-1 and -2 experiments, however, chemical release experiments at F-layer altitude have never been previously reported in Japan. Several rocket experiments with chemical release of Lithium, Barium, Strontium, etc., in U.S.A., Canada, India, and Australia were reported mainly in 1980's. Release from orbital satellite of Cress was also reported.

Lithium is selected for this experiment, because it has light mass comparable with F-layer altitude atmosphere, long ionization time, and one of the most effective g-factor for resonance scattering. Based on the basic feature of previous canisters in several articles, Lithium canister (LES) and optical instruments for Lithium tracer observation from ground has been currently developing.

3. Discussion

Three rocket-released Lithium tracers will be seen in evening sky not as trail-type tracer like TMA but as red cloud-type tracers with fast diffusion speed. Based on estimation of resonance scattering intensity of Lithium as well as background intensity of evening sky, a 1 M Rayleigh Lithium cloud will be measured at 5 s after a release, however, a 10 K Rayleigh at 50 s, and about 500 Rayleigh at 250 s, by diffusion. It leads the intensity of Lithium cloud in 20 nm bandwidth condition will be reached in limitation of S/N within a few minutes after the release.

In this talk, based on the estimation above, feasibility of rocket launch condition for Lithium release experiment with ground observation sites will be reported. Because the multiple-site observation of Lithium clouds is significant in the WIND experiment, cooperation of ground based observation is welcome. Since we have conducted the SSH consortium of 14 high schools for sprites observation in January to March, 2007, we will provide an outreach program with the SSH consortium so as to observe the evening red clouds in thermosphere.