Development of a New Thermospheric Neutral Atmosphere Sounding Technique and Study on Upper Atmospheric Science

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Objective

Precise measurement of thermospheric neutral atmosphere is important for an understanding of long-term Earth climate change. Here we would like to develop new sounding technologies to detect wind, density, and composition of rarefied neutral atmosphere so as to build applications for sounding rocket and/or satellite payloads. Sounding technique by electromagnetic waves is also important for upper atmospheric study. Developing a meteor radar system is another target of our laboratory.

Project Outline

1) Upper Atmospheric Wind Measurement

Measurement of upper atmospheric wind is very difficult. We have been developing a new technique for measuring neutral wind, in a chemical release experiment using a sounding rocket. Releasing Lithium vapor on trajectory can enable the imaging of resonance scattering light by multiple ground sites. Developing high S/N imaging and precise triangulation analysis technique will contribute to an understanding of long-term climate change on Earth.

2) Development of Rarefied Neutral Atmosphere Measurement Technique

Measurement of rarefied neutral atmosphere is also very difficult. We believe that through the application of laser technology to a payload on board a sounding rocket and/or a satellite, measurement of atmospheric density and its composition in the Earth's thermosphere can be greatly improved. Basic elements of such a measurement technique as well as the development of an application will be targets of this study.

3) Development of Forward-scattering Meteor Radar Facilities

Meteors can usually be seen in the night sky. However, it can be measured by using radar technology. High-power radar facilities have been developed and used in upper atmospheric studies in the world, but if forward-scattering technique is applied to meteor radar, low-power radar system could be identical to meteor mapping in some cases. Developing forward-scattering meteor radar facilities with high-resolution trajectory information for individual meteors is another key goal of this study.

References

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