Observation of Jupiter's Atmosphere by Telescope Observatory for Planets on small Satellites (TOPS)

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TOPS (Telescope Observatory for Planets on Small-satellite) is a space telescope mission designed for observation of planets, and is proposed as a candidate for the next generation small scientific satellite mission. In this talk, the scientific goal of TOPS at the observation of Jupiter's atmosphere is presented.

1. Spatio-temporal distribution of clouds and ammonia

The composition of Jupiter's uppermost cloud layer is usually considered to be NH_3 ice. However, its observational evidence is still weak; both spacecraft observation which is generally short of wavelength resolution and ground based observation which is generally short of angular resolution can not provide us with data whose quality is high enough to be used for an inversion model with large degree of freedom.

The tunable liquid crystal filter on TOPS allows collection of high wavelength resolution, high angular resolution image in a very short time, and can contribute to high-precision determination of the distributions of uppermost clouds and ammonia in Jupiter's atmosphere.

2. Observation of Lightning

Lightning in Jupiter's atmosphere is caused by convective clouds driven by condensation of water in the lower troposphere, direct observation of which is very difficult. TOPS will try to detect lightning on day side of the planet with the combination of the high angular resolution achievable outside the earth's atmosphere, the high wavelength resolution achievable with the liquid vrystal filter, and, the high temporal resolution achievable by the high speed imager.

3. 4-dimensional database of Jupiter Image

With its ability to observe planets even within small angle from the sun, TOPS can gather the multi wavelength image database of Jupiter with a homogeneous quality for a long time. This database can correspond to the legacy observational data of earth's atmosphere colleted in FGGE (First GARP Global Experiment; GARP stands for Global Atmospheric Research Program), which triggered the rapid progress of global numerical weather prediction on the earth beggning from early 1980s, and potentiall serve as an indispensable foundation of Jupiter's atmospheric research including future development of the realistic numerical model of Jupiter's atmosphere.