Current status of the PLANETS telescope project for planetary and exoplanetary atmospheric monitoring

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We are conducting a 1.8-m aperture off-axis telescope project PLANETS under international collaborations. In this presentation, we report the current status of PLANETS project and our scientific targets, and also promote use cases in other research fields in astronomy and planetary/exoplanetary sciences. PLANETS is characterized by low-scattering and high-contrast capability thanks to off-axis mirror system, and also by monitoring observation. We mainly concern variations in planetary atmospheres, faint gases produced from satellites, exoplanetary atmosphere, and also welcome other targets that match to the advantages of PLANETS. Continuous monitoring is essential to understanding the planetary atmospheric phenomena, and therefore, own facilities with even small- and medium sized telescopes and instruments are important. We have demonstrated that continuous monitoring is effective for understanding planetary and satellite phenomena using small telescopes at the summit of Mt. Haleakala, Hawaii (3050 m altitudes). We are now operating 40 cm (T40) and 60 cm (T60) telescopes at Haleakala combined with high-resolution spectrometers in visible and infrared ranges to observe faint atmospheric emissions/absorptions, such as plasma and neutral torus produced by Jupiter’s satellite Io, neutral torus produced by Saturn’s satellite Enceladus, gases in Venus and Mars, sodium gasses of Mercury, and so on. The polarization imager DIPOL-2 is also installed to measure the weak polarization of exoplanetary light. Our and guest investigators’ observations are also linked to Mercury, Venus (Akatsuki), Mars (Mars Express, MAVEN) and Jupiter (Juno) missions.
To achieve precise spectroscopy and polarimetry for faint emissions/absorption in planetary/exoplanetary atmospheres and satellites, PLANET’s a 1.8-m aperture with low-scattered light optics is necessary. PLANETS project is managed by the PLANETS Foundation (www.planets.life), which is an internationally organized entity whose board members are from several institutes in Japan, USA, Germany, Brazil, and France. This off-axis optical system brings us unrivaled high-dynamic range scientific capabilities on coronagraphy and polarimetry. It will have a Gregoian focus with a FOV of 6' (Fno=13) and a Coude focus with a FOV of 20" (Fno=49). The main mirror is Clearceram Z-HS with a diameter of 1850 mm, which is now on the final polishing process. We are designing mechanical structure of telescope for both cases of equatorial mount and azimuthal-elevation mount. We are also designing a mirror support structure in two ways, active support and passive support. We are aiming to get first light with PLANETS telescope within next several years.

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