

Development of new telescopes dedicated to the observation of 'planets' at Haleakala, Hawaii (& others)

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We have run the project to develop the telescopes dedicated to the observations of planets and exoplanets at the summit of Mt. Haleakala of Maui Island, Hawaii, under the international consortium formed with the Institute for Astronomy (IfA) / Univ. of Hawaii (UH) and several groups in USA, Mexico, Canada, and Europe. This project consists of several parts: The main is the new construction of the 1.8m off-axis telescope named 'PLANETS'. We also have two sub telescopes, i.e., the 80cm telescope operated by Univ. Hawaii, and the 60cm telescope operated by Tohoku Univ.

Clear sky and good seeing condition are definitely important for any ground-based observations. The Haleakala High Altitude Observatories is not the highest place (elv. 3050m), but one of the best sites with clear skies, good seeing, low humidity conditions. It can easily be operated by its good accessibility from Japan, the airport, the town, associated with a good engineering facility, ATRC (Advanced Technology Research Center) of the IfA/UH. At there, our group has been operating a 40cm Schmidt-Cassegrain telescope, observing faint atmospheric and plasma features such as Io plasma torus, Mercury, Lunar sodium tail, and so on. Atmospheric escapes from Mars and Venus and the exoplanets close to mother stars are also possible topics as the next extensions.

The 1.8m PLANETS (Polarized Light from Atmospheres of Nearby Extra Terrestrial Planets) telescope will have the first light in 2014, in the earliest case. It has an off-axis primary mirror (provided from Tohoku Univ.) with a diameter of 1.8 m. With the support of state-of-the-art adaptive optics and masking technologies, we can avoid diffraction due to a spider structure that holds a secondary mirror and to minimize the scattered light from mirror surfaces as far as possible. With the instruments set to Gregorian focus on an equatorial mount and Coude focus for large-sized spectrometers, it can provide us a unique facility for spectroscopic and polarimetric observations of faint environments around the bright bodies, like planetary environments, stellar disks, etc. In 2013, we start the polishing for the a ultra-smooth mirror surface, the roughness of less than 1/20 lambda, with a new polish technology called HyDra, a water jet polishing technology developed by a group at Univ. Nac. Aut. de Mexico (UNAM). (This project is also a test for this new technology applied to off-axis mirrors.)

The UH 80 cm with equatorial mount is completely optimized to the polarimetric studies. It is served by Harlinton Center for Innovative Optics (Canada), and operated by IfA/UH with Kiepenheuer Inst. Sonnenphysik (Germany). The Gregolian optics for the PLANETS will be tested at there. The 60 cm Cassagrain telescope is now at our Iitate Observatory. We started the reformation of its equatorial mount optimized to the Hawaiian latitude, and will move it to Haleakala before the summer of 2013. It is small-sized but unique because it has Coude focus for relatively large-sized instruments. It will not only be used for the infrared / spectroscopic observation which cannot be done by the current 40cm, but also the instrument testing for the PLANETS.

In the end of 2013, ISAS Exceed EUV space telescope will run on the orbit. In early 2014, joint observation with HST for Jovian activities will be executed. This 60cm telescope will supply the simultaneous and continuous imaging and spectroscopic data for Jovian infrared auroras. Our 40cm Schmidt telescope will also serve the Io torus imaging spectroscopic information.

For promoting the project, M. Kagitani has been staying in Maui and contributing to the optical fiber Echelle spectrograph development. From June 2012, S. Okano officially belonged to ATRC. The instruments developed in our group, i.e., NIR/MIR Echelle spectrograph and MIR heterodyne spectrograph will also contribute to these telescopes.