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ハワイ・ハレアカラ山頂への惑星専用望遠鏡設置計画：VIII
Development of a New Telescope Dedicated to Observation of Planets at Haleakala, Hawaii : VIII

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We are constructing a 1.8m new telescope at the summit of Mt. Haleakala, Maui, Hawaii. It is under the collaboration with the Institute for Astronomy (IfA), University of Hawaii. In 2011, the fabrication of the primary mirror has been done. And plans of development timeline, facilities required for the development, telescope mechanical structure, and the dome were made. In 2012, we will start actual development along the timeline, and go into the most key phase in the development. The first light will be, if everything goes well, in 2014.

Clear sky and good seeing condition are definitely important for any ground-based observations. The summit of Mt. Haleakala in Maui, Hawaii is not the highest place (elv. 3050m), but one of the best sites with clear skies, good seeing, low humidity conditions, and good accessibility for us. At the Haleakala High Altitude Observatory at the summit, our group has been operating a 40cm Schmidt-Cassegrain telescope, and we have so far observed faint atmospheric and plasma features around bright planets, Io plasma torus, Mercury and Lunar sodium tail, and so on. Atmospheric escapes from Mars and Venus, the exoplanets close to mother stars are also possible topics. However, when we try to observe those faint emissions surrounding the bright objects, intense scattered light is always the most serious problem.

The new project, called PLANETS (Polarized Light from Atmospheres of Nearby Extra Terrestrial Planets), is dedicated to the observation of solar system planets and exoplanets. It consists of an off-axis primary mirror with a diameter of 1.8m, and Gregorian optics on an equatorial mount. State-of-the-art adaptive optics and masking technologies will be adopted to eliminate the scattering light. Based on these designs, it can avoid diffractions due to a spider structure that holds a secondary mirror and to minimize the scattered light from mirror surfaces as far as possible. In addition, the telescope optics will have 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.) Since a telescope completely optimized to a wide dynamic range does not exist yet, 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.

This project is based on the collaboration among PPARC / Tohoku Univ., IfA / Univ. Hawaii (USA), Kiepenheuer Inst. Sonnenphysik (Germany), UNAM (Mexico), Univ. Turku (Finland), Harlingten Center for Innovative Optics (Canada), Stan Truitt (USA), Craig Breckenridge (Canada), and other collaborators. In 2011 March, after the Earthquake, the primary mirror glass blank completed in Japan was shipped to US, and now in the generating process. We also established the team structure, development timeline, and facilities required for the development. The main development will be at ATRC (Advanced Technology Research Center) of IfA in Maui. In 2012, all designs of the telescope mechanical structure and the domes will be finalized, and construction of development facility and structures will actually be started.

For promoting the project, Dr, Kagitani has been staying in Maui in 2011FY, and is contributing to the optical fiber Echelle spectrograph developments at ATRC. From June 2012, Prof. Okano will also be staying at ATRC/IfA. Associated with such residence, we are also preparing to move a 60cm telescope of Tohoku Univ. to the summit. In the paper, we summarize the overview of our drastic steps toward this future expected in this year.

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