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UV Space Telescope for extrasolar planetary systems

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Many observations have been performed for exoplanets since the first discovery in 1995. The number of detected exoplanets is more than 1800. Some of them orbit around a star with an orbital radius shorter than that of Mercury, which suggests that the high-intensity UV irradiation causes large amount of atmospheric loss.

Many exoplanets were discovered by observing transits. Exoplanetary atmospheric atoms and molecules absorb stellar photons, which causes wavelength-dependent transit depth, though transit depth of an exoplanet without any atmosphere is not wavelength-dependent. Therefore, we can know atmospheric composition from the result of spectroscopic observation of exoplanet transit.

The radius of the exoplanet HD209458b is approximately 1.4 Rj and its semi-major axis is only 0.047 AU. It is called Hot Jupiter. Sodium, hydrogen, magnesium, and H2O have been detected in its atmosphere. Hydrogen was detected using the Hubble Space Telescope and the result shows the optically thick hydrogen atmosphere extends to three times farther than its radius. This also suggests that very large amount of atmospheric loss occurs in the exoplanetary system, which is not in the solar system.

NASA and ESA have already launched and are planning to launch space telescopes dedicated for exoplanets, however, their spectral range is limited to visible and infrared. Though the Hubble Space Telescope is the only telescope for UV range, the operation will be stopped in the near future because of its aging. In this presentation, we introduce our plan for a small UV space telescope project.

Keywords: exoplanet, ultraviolet, space telescope