Transit observation of extrasolar planetary atmosphere: absorption feature and reflected light

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Since the first discoveries of extrasolar planets orbiting main-sequence stars by Mayor and Queloz (1995) and Marcy and Butler (1996), more than 110 extrasolar planets have been discovered so far. Among them, HD209458 (V=7.58), is unique in that the transit of the planet across the disk of its primary star has been observed photometrically for the first time (Henry et al. 2000, Charbonneau et al. 2000). In addition to the fact that this provides unambiguous proof of the existence of the orbiting planet, a variety of interesting measurements were made possible combining with the radial velocity data. Among others, Charbonneau et al (2002) detected the first ever signature of the atmosphere of the extrasolar planet from the additional neutral sodium absorption during the transit. Even more amazingly Vidal-Madjar et al. (2003) recently reported the presence of an extended upper atmosphere of hydrogen atoms which are indeed evaporating from the planet.

Motivated by these recent major discoveries achieved by HST, we started an independent and complementary ground-based observation project using Subaru telescope. We make use of the HDS (High Dispersion Spectrograph) on Subaru to search for signatures of the reflected light from HS209458b at the phase opposite to the transit and also for additional absorption features during the tansit at the Balmer lines.

In this talk, I will briefly summarize the current observational status of the extrasolar planetary atmosphere, and then report the preliminary results from our observing run. Finally I will discuss future prospects for combined analysis of photometric and spectroscopic observations of transiting planets.