observation and analysis of exoplanets by using Dipol-2 of T60 telescope at Haleakara mountain

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We have started continuous observation of exoplanets from January 2015 by a method of polarimetry using DIPOL-2 (a double image high precision polarimeter, Piirola_et., al 2014) attached to Haleakara T60 telescope. The light scattered or reflected in the planetary atmosphere is linearly polarized. An observer receives the polarized light from the exoplanet as well as non-polarized light from a main star. Thus, periodic variation of linear polarization is observed as the exoplanet orbits around the main star. The polarimetry gives us an information about orbital elements of the exoplanet as well as their atmosphere, even if they do not transit the main stars. Practically, maximum degree of polarization is about an order of -4 through -5 for typical hot Jupiter. Because of difficulties of such a high-precision polarimetry, there is only a successful polarimetry of exoplanet (Berdyugina et al., 2008 2011). One of the primal goal of this study is to establish an observing technique and a analysis method for high-precision polarimetry. To achieve high-precision polarimetry better than 10^(-5), , we need to determine instrumental polarization carefully. First, we analyzed measurements of two high-polarized star (HD204827,HD25443) which enable us to determine reference axis of linear polarization. Then we made analysis of non-polarized standard stars to determine the instrumental polarization. In 2015, we have observed non-polarized standard stars 19 in January, 12 in May, 18 in Augustand 10 in October, 59 in total.. Then, we derived instrumental polarization at accuracy of 10^(-5), except for the data in January which do not have enough tracking accuracy. We also have several measurement of three exoplanets (tau_boo b, HD189733 b, 55Cnc e). We would be able to get variation of polarization of exoplanets by subtracting instrumental polarization from the observed polarization. We chose hot Jupiter type exoplanets as observing targets, because they rotate around the main stars by two or three days and we can get polarimetric measurements in the different phase angle within a short time. In this presentation, we will present the recent result of instrumental polarization, method of estimation of the exoplanets' polarization and the recent result from the three exoplanets.

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