

Search for Earth-like planets around late-M dwarf stars using the infrared Doppler

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We are proposing to conduct a strategic infrared Doppler survey for extrasolar Earth-like planets around M dwarf stars using a new astronomical infrared instrument (InfraRed Doppler instrument, IRD) for the Subaru telescope at Hawaii. For very precise radial velocity measurements in the infrared wavelength, IRD is composed of a stable astronomical high dispersion spectrograph and a laser-frequency comb as a precise wavelength calibrator covering the range of 0.97-1.75 micron. The main goals of the IRD survey are to achieve a radial velocity precision of 1m/s for late-M dwarfs and to search for Earth-like exoplanets around low-mass stars. Planetary systems around low-mass stars are attractive targets to detect extrasolar Earth-like planets in the habitable zone by the Doppler method because of relatively large signals caused by the planets and their close-in habitable zone. For the advantages of IRD and late-M dwarfs, we plan to perform a new unique large-scale planet search program to look for Earth-like planets by the Doppler method using the IRD and the Subaru telescope.

We have a plan to perform the first light of IRD in this summer and start the full-scale Doppler survey. In this survey, we would like to have 170 observing nights for 5 years from 2017 and observe ~100 carefully-selected late-M dwarfs. We performed a detailed survey simulation and target selection of suitable stars for the survey based on the theoretical simulation and real observation schedule. We will expect the discovery of more than 10 Earth-like planets in the habitable zone and more than 50 exoplanets for the survey period of 5 years. In this presentation, we report the current status of the construction and the observation plan and discuss expected detectable Earth-like planets and impacts on the exoplanet study in the Subaru/IRD survey.

Keywords: Earth-like planets, late-M dwarf stars, Infrared Doppler observation