The Numerical Simulation for Detecting Atmospheric Oxygen on Exoplanets Around M and K Stars.

*Toru Muraoka[1], Osada Naoya[1], Shingo Kameda[1], Go Murakami[2], Norio Narita[3], Masahiro Ikoma[4], Hitoshi Fujiwara[5]

1. Rikkyo University, 2. Institute of Astronomical Science, Japan Aeronomy Exploration Agency, 3. National Astronomical Observatory of Japan, 4. Tokyo University, 5. Seikei University

To date, more than 4000 exoplanets have been detected. In recent years, thanks to the activities of probes such as Kepler and TESS, study on terrestrial planets in the habitable zone (HZ) around M-type and K-type low-mass, low-temperature stars has been advanced. Characterization of such a habitable exoplanet requires Transit spectroscopy and the detection of a planet's atmospheric elements. However, in general, the detection of planetary atmospheric elements other than hydrogen is difficult owing to their small distribution compared to the size of the planet. M and K stars are relatively active and emit strong UV radiation. An oxygen-rich, carbon dioxide-poor (i.e., Earth-like) atmosphere of a planet located in such a star's HZ would get heated by ionization and dissociation and expand to significant size compared to the planetary radius [Kulikov et al., 2007, Tian et al., 2008b]. The World Space Observatory-UV (WSO-UV) is a multi-national space telescope project, led by Russia, to be launched in 2025. The key scientific objective would involve studying extrasolar planetary atmospheres in the presence of strong UV radiation fields. In this study, we simulated Earth’s atmosphere by considering that the Earth was placed in the HZ of M and K stars. Furthermore, we estimated the possibility of detecting oxygen by means of simulated transit spectroscopic observations.

Keywords: exoplanetaly atmosphere, transit spectroscopy

