# Detecting molecular lines in thermal emission spectra of temperate planets with SPICA/SMI

*Yuka Fujii[1], Taro Matsuo[2], Yui Kawashima[3], Kazumasa Ohno[4], Ayaka Okuya[4], Teruyuki Hirano[4]

1. Earth-Life Science Institute, Tokyo Institute of Technology, 2. Nagoya University, 3. Netherlands Institute for Space Research, 4. Tokyo Institute of Technology

We examine the utility of SPICA/SMI for characterizing the thermal emission spectra of exoplanets. The sensitivity at > 10 μm is useful for the observations of relatively warm/cool planets (around 300K) as their planet-to-star contrast significantly improves at these wavelengths. We modeled the thermal emission spectra of temperate Jupiter-like planets and found that the prominent features of $NH_3$ and $H_2O$ would be expected at the wavelengths of SPICA/SMI. Their high-frequency features are detectable with a reasonable amount of integration time. We found that combining the data at various orbital phases is critical to suppress the correlated photon noise due to the spectral features of the stellar light. The high-resolution spectroscopy with SPICA/SMI is also able to measure their line-of-sight velocities, which allows us not only to measure the orbital inclination (and thus the true mass) but also to search for large moons or the binary planet system (Ochiai et al., 2014). This is relevant for warm/cool planets as the companions are dynamically more stable around them than around hot Jupiters. We also examine the detectability of the atmospheric features of terrestrial planets around nearby low-mass stars, e.g., Proxima Centauri b. The high-resolution spectroscopy (12-18 μm) and mid-resolution spectroscopy (18-40 μm) of SMI would be useful to probe $CO_2$, $N_2O$, and $H_2O$, while the required integration time is much longer. We discuss the range of accessible targets and the requirements for the stability of the pre-processed data.

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