

Exoplanet exploration for brown dwarfs with infrared astrometry

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The astrometry is one of the oldest method for the exoplanet exploration. However, only one exoplanet has been found with the method. This is because the planet mass is sufficiently smaller than the mass of the central star, so that it is hard to observe the fluctuation of the central star by the planet. Therefore, we investigate the orbital period and mass of planets which we can discover by the future astrometric satellites for brown dwarfs with the mass less than a tenth of the solar mass.

So far five planetary systems have been found, whose mass ratios are larger than a tenth. For example, for the system whose distance, orbital period and mass ratio are 10 pc, 1 year and a tenth, respectively, the apparent semi-major axis reaches 3 milli-arcsecond, which can be well detected with the future astrometric satellites such as Small-JASMINE and Gaia. With these satellite, we can discover even super-Earth for the above system.

We further investigate where in the period-mass plane we can explore the planet for individual brown dwarf with Small-JASMINE and Gaia. As a result, we find that we can explore a wide region where period and mass are within 5 years and larger than 3 earth mass. In addition, we can explore the region around 0.1 day and 10 jovian mass, where planets have never found for any central star, and where we can explore only with Small-JASMINE for most target brown dwarfs.

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