

Gravitational Microlensing Surveys for Exoplanets

*Daisuke Suzuki¹

1. Institute of Space and Astronautical Science / Japan Aerospace Exploration Agency

Gravitational microlensing can detect cold planets beyond the snow line. It is sensitive to the planets down to the Earth mass. Thus, it is only microlensing among the current exoplanet detection methods that can probe the outer planets orbiting other stars. In this talk, we present the recent microlensing statistical study which finds a disagreement between the observed planet mass-ratio function and the prediction from the population synthesis models based on the core accretion model. The models predict 7 - 10 times fewer planets at mass-ratios of $10^{-4} < q < 10^{-3}$ than found by the microlensing observations. This implies that the formation of gas giants may involve more complicated processes than assumed by the standard core accretion theory. Or, it implies that the planet formation process may vary significantly as a function of host star mass, because the population synthesis models have been calibrated for planets around solar-type stars while microlensing observations are biased toward lower-mass stars.

We also present recent planet discoveries with mass constraint and/or measurement by using the space-based observations or 10m class telescopes. Finally, we introduce future, infrared microlensing surveys, such as the PRIME (PRime-focus Infrared Microlensing Experiment) project and NASA's WFIRST (Wide Field Infrared Survey Telescope) microlensing survey.

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