

Searching for extrasolar planets by microlensing: Discovery of a 5.5 Earth mass planet OGLE-2005-BLG-390Lb

Dijana Dominis Prester

University of Rijeka

Abstract:

Gravitational microlensing can reveal extrasolar planets orbiting the foreground lens stars if the light curves are measured frequently enough to characterize planetary light curves with features lasting a few hours. Microlensing is most sensitive to planets in Earth-to Jupiter-like orbits with semi-major axis in the range 1-5 AU.

We (PLANET, OGLE and MOA collaborations) have detected a 5.5 Earth mass planet named OGLE-2005-BLG-390Lb orbiting a 2.2 solar mass M-dwarf host star at a separation of 2.6 AU, at a distance of 6.6kpc. This is the lowest-mass and the coolest extrasolar planet, out of more than 200 planets discovered up to date. Our detection, together with a latter detection of OGLE-2005-BLG-169Lb, suggests that cool, sub-Neptune-mass may be more common than gas giant planets, as predicted by the core accretion theory.

The basics of microlensing will be explained, and microlensing surveys towards the Galactic Bulge searching for extrasolar planets presented, with special emphasis on the role of binary stars as lenses and sources. Numerical optimization methods for light curve modeling and breaking ambiuguitis in light curve solutions will be discussed, explained using the example of OGLE-2005-BLG-390Lb planet discovery. Some new ideas and methods for improving planet detection by microlensing will be presented.