

Discovery and Mass Measurements of a Cold, Sub-Neptune Mass Planet and Its Host Star

The gravitational microlensing exoplanet detection method is uniquely sensitive to cold, low-mass planets which orbit beyond the snow-line, where the most massive planets are thought to form. The early statistical results from microlensing indicate that Neptune-Saturn mass planets located beyond the snow-line are substantially more common than their counterparts in closer orbits that have been found by the Doppler radial velocity method. We present the discovery of the planet MOA-2009-BLG-266Lb, which demonstrates that the gravitational microlensing method also has the capability to measure the masses of cold, low-mass planets. The mass measurements of the host star and the planet are made possible by the detection of the microlensing parallax signal due to the orbital motion of the Earth as well as observations from the EPOXI spacecraft in a Heliocentric orbit. The microlensing light curve indicates a planetary host star mass of $M_{\text{sun}} = 0.54 \pm 0.05 M_{\text{sun}}$ located at a distance of $D_L = 2.94 \pm 0.21$ kpc, orbited by a planet of mass $m_p = 9.8 \pm 1.1 M_{\text{Earth}}$ with a semi-major axis of $a = 3.1^{+1.9}_{-0.4}$ AU.