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Frozen super-Earth by microlensing

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Core accretion models are today the best alternative to explain the formation of planetary systems: accretion of planetesimals lead to the formation of cores, which then start to accrete gas from the primitive nebula (Laughlin G., et al., 2004 ApJ 612,L73). This scenario predicts in the case of M stars a preferred formation of low mass planets (Earth Neptune) in a few million years and at distances between 1 and 10 AU. More massive planets (Jupiter) formation is hampered by a longer formation time (10 Myr) during which the gas evaporates and is no longer available to be accreted. This is precisely around this type of stars and at these distances from the star that the microlensing technique has its maximum sensitivity. It presents a sounding advantage over competitive techniques (radial velocities or transits) as being the only method sensitive in this range of distances and low masses.

The objective of the PLANET collaboration is the discovery of low mass planets (1-15 Earth masses) within 1-5 AU of the most common stars in our Galaxy, the M stars, in order to measure their frequency. To achieve this goal, we use the gravitational microlensing effect by following the light curve of stars at 8 different telescopes belonging to the PLANET/RoboNET collaborations (32 scientists). After only two detections of Jupiter-size companions around M stars, we have detected in 2005 a planet of 5.5 Earth masses only at 2.8 AU of its M star (Beaulieu et al. 2006, Nature), which is the first member of a new family of cold telluric planets. This detection confirms the power of this new method and, given our detection efficiency, it suggests that these new planets may be quite common around M stars.