The boundary between brown dwarfs and planets

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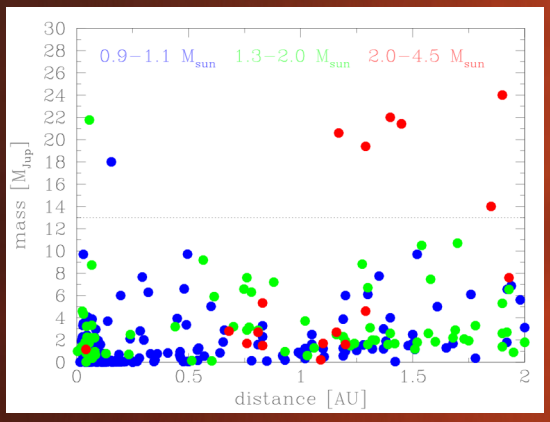


Intermediate-mass stars have companions in the mass range from 10 to 30 M_{Jup}

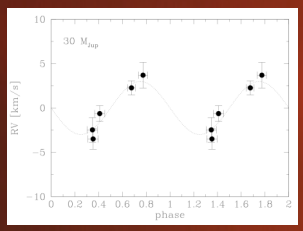
The Figure on the left shows masses of known planets for stars of different mass (using data given in Exoplanet.eu). Stars more massive than the Sun often have companions in the mass-range between 10-30 M_{jup} (dashed line at 13 M_{Jup}).

What are these objects and how did they form? Are they just the extension of the planet population, or are they something entirely different? By measuring their density we can learn more about their internal structure. This requires to find transiting objects.

A survey for planets and brown dwarfs of stars more massive than the Sun

Using the CoRoT-database we have initiated a survey for transiting, substellar objects orbiting early F to A stars (1.3-2.1 M_{Sun}). CoRoT is ideally suited for such a survey, because it has the sensitivity to detect brown dwarfs orbiting stars as early as B4V, and more than 20% of the stars that CoRoT has observed are early F and A-stars (Guenther et al. 2012). Although A and early F-stars often rapidly rotating, masses of brown dwarfs with orbital periods of a few days, which are preferentially detected in transit surveys, can well be determined.

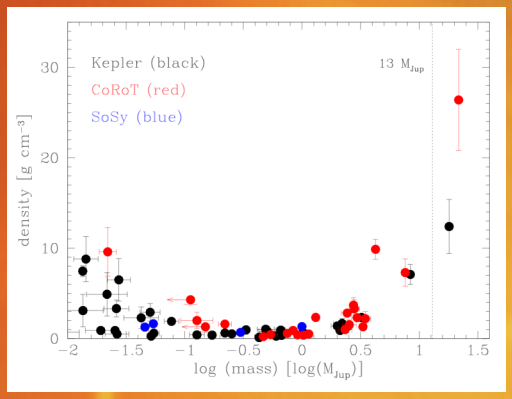
Results



The figure on the left shows the RV-curve of a transiting brown dwarf which is orbiting an A6V-star that has recently been found by our team.

CoRoT has already discovered 2 brown dwarfs and 4 planets that are more massive than 3 M_{Jup}. The Figure on the right shows the log(mass)-density diagram that has been obtained by CoRoT and Kepler. There is no obvious discontinuity in the density at 13 M_{Jup}. In this sense, objects more massive than 13 M_{Jup} seem to be a continuation of planet population.

The table below summarises the properties of the substellar objects that have been found by CoRoT.



name	M_{star}[M_{Sun}]	M_{comp} [M_{Jup}]	density [gcm^{-3}]	reference
CoRoT-2b	0.97±0.06	3.31±0.16	1.31±0.04	Alonso et al. 2008
CoRoT-3b	1.37±0.09	21.66±1.00	26.4±5.6	Deleuil et al. 2008
CoRoT-14b	1.13±0.09	7.6±0.6	7.3±1.5	Tingley et al. 2011
CoRoT-15b	1.32±0.12	63.3±4.1	59^{+37}_{-32}	Bouchy et al. 2011
CoRoT-18b	0.95±0.15	3.47±0.38	2.2±0.8	Hébrard et al. 2011
CoRoT-20b	1.14±0.08	4.24±0.23	8.87±1.10	Deleuil et al. 2012