



Metallicities of planet-hosting G-stars and their implications for terrestrial-like planets – a statistical analysis

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Abstract

A statistical analysis based on the estimated iron contents within terrestrial-like exoplanets and the metallicities of G-stars was performed in order to make predictions on the potential of the stars to host planets.

1. Introduction and Background

Up-to-date statistics on the total number of known (confirmed) exoplanets and their main characteristics list a total number of 552 extrasolar planets (as of: May 31, 2011, [4]). On February 2, 2011 1235 planet-candidates discovered by the Kepler mission are known (16 are confirmed up to now, [1]). Thereby, 68 planets are assumed to be of approximate Earth-size ($< 1.25 R_E$) and 288 super-Earths (1.25 to $2 R_E$). Even though most of these planets can be characterized as gas planets, an increasing number of terrestrial-like exoplanets is known. Nevertheless, almost only observational data on the masses and sizes of exoplanets are available and can be used for further analyses. For some objects (e.g. Corot 7-b, [3]) also the scenario that this exoplanet is the remaining core of a previous gas planet cannot be ruled out, but a model for its interior can be used to give a further argument against this hypothesis and to show that it is more reasonable that Corot 7-b was a terrestrial planet throughout its whole lifetime.

2. Model-Description

We have used an uncompressed density model ([2]) and defined two internal layers (core and mantle) for the exoplanets of interest. Thus we are able to estimate the sizes of their cores and mantles. Different model scenarios with respect to variations in the Fe, Ni, S contents in the core of these planets

as well as different scenarios for their mantle compositions have been implemented. Due to the available model restrictions only a consideration of G-stars (because only for this scenario serious comparison-values for the terrestrial planets of our Solar System exist) is reasonable.

3. Results

Based on the estimated iron contents of Earth-size- and super-Earth-exoplanets we have investigated the statistics on the metallicities of known G-stars which host planets in order to make predictions on potential extrasolar planets still waiting for their discovery.

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References

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