EXOPLANETS

Know thy star, know thy planet — or not?

Astron. J. **158**, 239 (2019)

Exoplanet formation models usually rely on the assumption that the more metals in the host star, the more metals in the giant planets of the system — since more metals means more solids in the feeding zone of the forming planet in its protoplanetary disk. However, Johanna Teske and collaborators have conducted a detailed study of 22 exoplanet systems and show that this is not the case: there is no metallicity 'enhancement' for giant planets in metal-rich systems; the metal content of a giant planet depends upon its mass.

The authors calculate abundances of Fe, Mg, Si, Ni, O and C in the systems' host stars, following a dedicated spectroscopic survey and subsequent Bayesian analysis, and calculate metallicities for their cool (<1,000 K) giant planets by employing a one-dimensional hydrostatic equilibrium model using radius and mass measurements. A linear relationship between stellar and planetary metal abundances (aggregated) can be excluded at the 2σ level. There is no clear explanation for this lack of a trend, but the authors suggest that a disk process that regulates solid surface densities (for example, radial drift of grains) could be at work, or perhaps that the orbit at which a planet forms in the disk interferes with the observed relationship.

The authors also uncover a tentative correlation between residual metal abundance (the relative amount of metals compared to that expected due to planet mass alone) and the ratio of volatile element (C, O) enrichment to refractory element enrichment: giant planets with more metals than expected have stars with a higher degree of volatile elements.

Paul Woods

Published online: 6 January 2020
https://doi.org/10.1038/s41550-019-1005-7