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Title: Planet-Metallicity Correlation Revealed By Kepler
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Abstract: Metallicity of exoplanet systems can serve as a critical diagnosis on the planet formation mechanisms. Using the data from Kepler, we studied the planet radii distribution of multi-planet candidates in two groups of systems with sub- and super-solar metallicity. We calculated planet-star ratios for planets of different radii and used them as a proxy of planet frequency. We corrected for planet frequency dependence on spectral types and stellar mass to study the planet-metallicity correlation. For orbital period within 100 days, we found a strong planet-metallicity correlation for gas giant planets (RP ≥ 5 RE). Planet frequency is 3.1 times higher for the super-solar metallicity group ([Fe/H] ≥ 0.0) than the sub-solar
metallicity group ([Fe/H] ≤ 0.0). For Neptune-like planets (2 RE ≤ RP ≤ 5 RE), planet frequency is comparable between the metal-rich and the metal-poor sample if adopting the planet-spectra-type correlation from Howard et al. (2012); or the planet frequency of Neptune-like planets for the metal-rich sample is 1.4 times higher than the metal-poor sample if assuming no spectral-type dependence (Fressin et al. 2013). No correction of spectral type is made for small-radii planet (RP ≤ 2 RE), and we found no planet-metallicity correlation for planets with such radii. We did not confirm the correlation between gas giant planet multiplicity and metallicity using the Kepler data alone.