EXOPLANETS

Flavours of Jupiter

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The existence of many gas giants orbiting very close to their host stars (the somehow-improperly termed 'hot-Jupiters') has been one of the biggest surprises of exoplanetary exploration. Such planets, in fact, do not exist in our Solar System. In recent years, several 'actual' Jupiters — gas giants with a mass and insolation comparable to Jupiter, which are more difficult to detect — have also been discovered. But why do some systems have hot-Jupiters and others, like ours, not? According to Lars Buchhave and colleagues, there might be an intrinsic reason linked to stellar metallicity.

It is now quite established that stellar metallicity affects the formation and evolution of planetary systems. The work by Buchhave et al. is the first systematic study for Jupiter analogues. Using a carefully selected sample, they compare the properties of stars hosting hot-Jupiters with those hosting Jupiter analogues. The case of Jupiter analogues in an eccentric orbit ('eccentric Jupiters') is also considered. They find that hot-Jupiters and eccentric Jupiters orbit stars with super-solar metallicity on average, whereas 'standard' Jupiters prefer solar-metallicity stars.

Using a simple model, Buchhave et al. infer what this result could mean for planetary formation. Metal-rich systems tend to form several giant planets and seem to be more dynamically active, with frequent collisions that send Jupiters in eccentric or close-up orbits. In solar-metallicity stars, instead, only one or two Jupiters can form, reducing scattering probability and favouring the formation of rocky planets in the inner disk. This scenario suggests that Earth-like planets could be more common around systems hosting Jupiter analogues.

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