UNIVERSITÄT DUISBURG ESSEN

PHYSIK E=

Physikalisches Kolloquium

Mittwoch, 21.05.2025
13:00 Uhr
MC 122 und Zoom

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

What makes a planet “giant”?

Prof. Dr. Ravit Helled, University of Zurich

The formation history of giant planets inside and outside the solar system remains unknown.
I will present a new path for giant planet formation where runaway gas accretion is initiated only at a mass of ~100 M_Earth. This suggests that the transition to a gas giant planet, a planet that its composition is dominated in hydrogen and helium, occurs at ~Saturn’s mass. Delaying runaway accretion to later times (a few Myr) and higher masses is likely to be a result of an intermediate stage of efficient heavy-element accretion that provides sufficient energy to hinder rapid gas accretion. This implies that Saturn has never reached runaway gas accretion, and that it is a „failed giant planet“. The transition to a gas giant planet above Saturn‘s mass naturally explains the differences between the bulk metallicities and internal structures of Jupiter and Saturn, and the characteristics of Uranus and Neptune. In terms of giant exoplanets, delaying runaway gas accretion to planets beyond Saturn‘s mass explains the transitions in the mass-radius (M-R) relations of observed exoplanets and the high metallicity of intermediate-mass exoplanets.