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Super Earths: The Structure of Massive Terrestrial Planets

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Super-Earths are the newest class of extra-solar planets with a mass range between 1-10 M_{\oplus} . We investigate the composition and structure of these planets. With their larger masses, they experience very large internal pressures. We find that the central pressure scales proportionately with mass, reaching values that challenge the understanding of rock behavior under such extreme conditions. Pressure also constraints the power law relationship between mass and radius of solid planets. The value for the exponent is 0.262 for super-Earths and 0.3 for planets between 5-50% M_{\oplus} . Despite uncertainties in the equation of state, composition and temperature structure, the mass-radius relationship is robust. Therefore, it is useful for inferring the expected signal in transit searches. In the next few years many super-Earths will be discovered and their masses and radius will be available. We find that there is a large degeneracy in composition that can fit an average density measurement.

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