

GIANT PLANET SCIENCE FROM THE KEPLER MISSION

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The most readily predictable science return from the Kepler Mission will be a greatly enhanced understanding of the structure, composition, and atmospheres of giant planets. Here, PI Jonathan Fortney, an expert in both the atmospheres and interiors of giant planets, proposes to join the Kepler science team. His work will be essential to the interpretation of giant planet radii, density, albedo, and light curve measurements to enable the maximum science return from the mission. PI Fortney will compute models of the structure, evolution, and contraction of planets in the Neptune to super-Jupiter mass range to aid in the interpretation of Kepler's initial planet detections. Trends in composition and core mass discerned by comparing measured radii to model radii in different planetary systems will allow us to better understand formation processes. He will also investigate the reflected flux from the close-in hot Jupiter planets that will be observed as a function of orbital phase. State-of-the-art spectral models of these atmospheres will be necessary to interpret albedo observations of these planets as both visible thermal emission and reflected stellar flux will be present in the Kepler band. For the most highly irradiated planets day/night temperature contrasts may be determined. Selected observations of some planets at high time cadence at particular orbital phases may allow for the characterization of condensates in these atmospheres. PI Fortney proposes to join the Kepler science team to interpret and model the data on atmospheres, interiors, structure, and evolution of the giant planets that will be discovered by the Kepler Mission. These investigations will have implications for the formation of giant planets and solar systems, as well as comparative planetary atmospheres. NASA's 2007 publication Science Plan for NASA's Science Mission Directorate extensively highlights exoplanet research within Astrophysics. These areas include: "Understanding the Diversity and Frequency of Other Worlds" and performing "Comparative Planetology." The 2006 NASA Strategic Plan lists several strategic goals. A key science question of Section 3D that we address is: "How do planets, stars, galaxies, and cosmic structure come into being?" A research objective with 3D that this project will help achieve is: "Progress in creating a census of extrasolar planets and measuring their properties." Here we seek to understand properties of giant planet interiors and atmospheres. The Kepler Mission Participating Scientists (PS) "Description of the Opportunity" lists "Characterization of Discovered Planets" as a Kepler Science Team activity. PI Fortney's proposed work will enable characterization of discovered giant planets both by revealing their interior structure and enabling determination of their atmospheric albedos and scattering properties.