EPSC Abstracts
Vol. 12, EPSC2018-72, 2018
European Planetary Science Congress 2018

Jupiter's Evolution with Primordial Composition Gradients

Ravit Helled (1), Allona Vazan (2) and Tristan Guillot (3)
(1) Institute of Computational Science, Center for Theoretical Astrophysics & Cosmology, Switzerland (rhelled@physik.uzh.ch) (2) University of Amsterdam, Anton Pannekoek Institute of Astronomy, Amsterdam, The Netherlands (3) Observatoire de la Côte d'Azur, Bd de l'Observatoire, Nice, France

Abstract

Recent formation models of Jupiter suggest that it could form with composition gradients. This possibility directly affects our understanding of Jupiter's bulk composition and origin.

We present Jupiter's evolution with a primordial structure consisting of a composition gradient with 40 $M_\oplus$ of heavy elements throughout the planet. We show that for this primordial structure most of the mixing occurs in the outer part of the gradient during the early evolution (several 10^7 yr), leading to an adiabatic outer envelope (60% of Jupiter's mass). We find that in that case the composition gradient in the deep interior persists; suggesting that ~ 40% of Jupiter's mass can be non-adiabatic (and therefore, not fully-convective) with higher temperatures than the ones derived from adiabatic interiors.

The derived current-state structure can be viewed as Jupiter with a diluted core, as suggested by recent Jupiter structure models that fit *Juno*'s gravity data.