

Parameter Study on Formation of the Giant Planets: Core Accretion Rates and Grain Opacities

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The giant planets which have large amounts of H-He gas are considered to have accreted the environmental nebular gas triggered by the formation of the massive solid cores. Previous works suggested that this "critical" core mass was about 10 times as large as the earth's mass. However, this value is not consistent with the planetary accretion theory, models of the interior structure and so on. In this study, we have reinvestigated the value of the critical core mass and the formation time itself taking a wide range of the core accretion rates and the grain opacities which are very important for the gravitational stability of the gaseous envelope. As a result, we have found that even a core smaller than 10 Earth's mass was capable of triggering the rapid accretion of the envelope.