Radiation Hydrodynamic Simulations of the Formation of Circumplanetary Disks

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Formation of regular moons and/or planetary atmospheres are governed by the gas flow into the vicinity of forming giant planets. Gas around a sufficiently massive planet is thought to form a circumplanetary disk instead of falling directly onto the planet. Recent studies, however, have shown that the circumplanetary gas forms an expanded envelope rather than a thin, rotationally supported Keplerian disk in cases where the gas temperature is very high. Thus, calculating the temperature of the accretion flow properly is important to determine the disk structure. We performed three-dimensional radiation hydrodynamic simulations of the formation of circumplanetary disks with an equation of states that considers effects such as hydrogen dissociation and helium and hydrogen ionization. The region within the deep potential of the planet reached very high temperature regime, however, we observe a disk to form in our simulations.

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