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Gas Accretion Flow onto Circumplanetary Disks from Protoplanetary Disks: Effect of Gap

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Satellite systems around gas giant planets are thought to be formed in circum-planetary disks, which are believed to exist at the gas capturing growing phase of giant planets. However, the structure of the circum-planetary disks are poorly known and thus current formation theories of satellite systems are forced to be constructed under not-well-established disk structures, which could impact the results.

In this study, we performed a series of hydrodynamic simulations of gas accretion flow onto circum-planetary disks from proto-planetary disks in order to analyze the structure of circum-planetary disks. In order to obtain fine structure of the gas flow around the planet, we employ nested grie method, which enable us to calculate high-resolution structure with high efficiency. In our previous studies, we do not consider the effect of gap, which would be created by the gravity of giant planets. But, this time, we consider the effect of gap to see if the accretion flow structure changes.

We found that, when there is a gap with symmetry about planetary orbit, the power-law distribution function of gas accretion flux onto the disk, which we obtained in the previous work, does not change almost at all. However, when the gap has some asymmetry, the distribution function of the accretion flow becomes more center-consentrated. This result under the more realistic setting would be important for the formation and evolution of the circumplanetary disks, which produce satellite systems.

Keywords: Satellite formation, giant planets, hydrodynamics