

Formation of Uranian system via a giant impact

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Obliquity of Uranus, an ice giant planet, is over 90° so Uranus is an anomalous planet in the solar system. One of the possible reasons is that by a giant impact the obliquity tilted. It is possible that after the giant impact materials is scattered and that Uranian satellites are formed by the materials. Also, to explain the formation of Uranian satellites by the reason, the scattered material need to include rock materials. In this study, we performed high resolution SPH simulations of giant impacts. We found that in the cases of using EOSs of previous studies internal structures of protoplanets are different geometrically and that those EOSs are tenuous on phase-change, so we use ANEOS and SESAME, which are strong on phase-change, in this study. From results of the simulations, we found that rock materials appear in the circumplanetary disk (the mass is less than 5% of the disk) in the case that the mass of impactor is a few Earth-mass and that the angular momentum of the target-impactor system is about 5 times current Uranian spin angular momentum. In this case, we confirm that the mean radius of the circumplanetary disk is ~ 2 * Uranian radius. These results are consistent with the initial condition of the circumplanetary disk in Ida et al. (in press) which solves the evolution of the disk after the giant impact. Also, we are going to introduce whether Uranus before an impact has a pure H-He atmosphere or an atmosphere which ice-planetesimals contaminate.

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