

## Giant impacts on planets with hydrogen atmospheres: Implication for the merger condition

\*Kenji Kurosaki<sup>1</sup>, Shu-ichiro Inutsuka<sup>1</sup>

1. Department of Physics, Nagoya University

Our solar system has two ice giants, Uranus and Neptune. Those planets have similar mass and radius but different obliquity and the intrinsic luminosity. Differences between Uranus and Neptune suggest origins of those planets. Ice giants were formed by collisions among large planetary embryos in the outer region of the proto-planetary disk. Thus, the ice giants' obliquities imply the histories of giant impacts during their formation. Previous studies for giant impact simulation for ice giants suggest that 1-3 Earth mass impactors can reproduce the present rotational angular momentums of Uranus and Neptune. Those impactors possibly have the atmosphere came from the disk gas, though the atmosphere for the impactor has not been considered by previous studies. In this study, we use the Godunov-type Smoothed Particle Hydrodynamic simulation to calculate the giant impact on the planets with the hydrogen-helium atmosphere. I will talk about the planetary mass, the angular momentum, and the atmospheric mass after the impact and discuss the origin of the ice giants.

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