# Constraining the Formation of Venus with N-body simulations of Terrestrial Planet Formation

*Patryk Sofia Lykawka[1], Takashi Ito[2]

1. School of Interdisciplinary Social and Human Sciences, Kindai University, 2. National Astronomical Observatory of Japan

One of the most difficult challenges in planet formation theory is to reproduce the orbits and masses of the terrestrial planets Mercury, Venus, Earth, and Mars. Here, we investigated terrestrial planet formation by performing extensive N-body simulations of primordial protoplanetary disks representative of typical models in the literature. Those disks consisted of embryos and planetesimals placed up to ~1-4 au (depending on the disk model).

We used our classification algorithm to identify the systems that formed planet analogs of Venus and Earth (in terms of orbit and mass) plus Mercury or/and Mars in the same system. From the analysis of the terrestrial planets formed in such 3- or 4-planet system analogs, we acquired detailed information about the formation and evolution of our identified Venus analogs. In particular, we obtained a-e-i-mass distributions, feeding zones, delivery of water/volatiles, number of giant impacts, accretion histories, and other properties about Venus analogs.

In this presentation, we also discuss the dependence of the results on the initial conditions, which allowed us to discuss the conditions that a protoplanetary disk must satisfy in order to form simultaneously the four terrestrial planets.

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