Gas-phase chemistry in the Jovian Circumplanetary Disk

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At the very end of its growth, Jupiter became surrounded by a circumplanetary disk (CPD), in which the Galilean moons formed. How the moons formed and interacted with the CPD remains an outstanding question. It is proposed that the moons formed from pebble accretion and underwent migration from type I and type II migration mechanisms. In the early stage of the CPD, type I migration of satellisimals was so rapid that all early formed objects fell on Jupiter. This suggests that the Galilean moons formed later during the CPD evolution. Other studies suggest that the moons were trapped in resonance chains, halting the migrations. In the coming years ESA mission JUICE and NASA mission Europa-clipper will visit the Jovian system. Both missions will study Jupiter’s icy moons' surface compositions. In this context, we aim to model the chemical evolution of the Jovian CPD to establish a connection between the origin of the moons and their bulk and surface compositions that will be retrieved thanks to the Juice and Europa-Clipper spacecraft measurements. So far, the gas phase chemistry has only been explored with a very limited set of chemical species in simple CPD models that were not related to the planet evolution (Prinn & Fegley, ApJ 249, 308 (1981)). Here we propose a CPD model adapted from the approach of Makalkin & Dorofeeva (Solar System Research, 48, 62 (2014)) and Heller et al. (ApJ 806, 181 (2015)) following the last phase of Jupiter’s accretion and computing the main outcome of 108 species issued from the KIDA chemical network. Results from equilibrium and non-equilibrium chemical reactions are presented.