



A new self-consistent hybrid chemistry model for Mars and cometary environments

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Over the last 15 years, a 3-D hybrid-PIC planetary plasma interaction modelling platform, named HYB, has been developed, which was applied to several planetary environment such as those of Mars, Venus, Mercury, and more recently, the Moon. We present here another evolution of HYB including a fully consistent ionospheric-chemistry package designed to reproduce the main ions in the lower boundary of the model.

This evolution, also permitted by the increase in computing power and the switch to spherical coordinates for higher spatial resolution (Dyadechkin et al., 2013), is motivated by the imminent arrival of the Rosetta spacecraft in the vicinity of comet 67P/Churyumov–Gerasimenko.

In this presentation we show the application of the new HYB-ionosphere model to 1D and 2D hybrid simulations at Mars above 100 km altitude and demonstrate that with a limited number of chemical reactions, good agreement with 1D kinetic models may be found. This is a first validation step before applying the model to the 67P/CG comet environment, which, like Mars, is expected be rich in carbon oxide compounds.