Geophysical Research Abstracts
Vol. 17, EGU2015-9850, 2015
EGU General Assembly 2015

An estimation for Enceladus' production of nanograins

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Enceladus' plume provides a unique laboratory for dust-plasma interactions. As shown by measurements of Cassini Plasma Spectrometer (CAPS) negatively charged nanograins as well as a small fraction of positively charged ones were detected in Enceladus' dust plume. However, there are no data of uncharged grains. Thus, the total grain production rate of Enceladus and its total contribution to Saturn's E-ring is still an open issue. Therefore, we present an estimation for uncharged grains as well as a total grain production rate from an analytical model and simulations in this work. The analytical model is derived from basic equations of grain charging and quasi-neutrality. In this model a first estimation for the fraction of uncharged grains results from negatively and positively charged grains. For more accurate estimations results from combined dust and plasma simulations are compared with our analytical ones and CAPS data yielding Enceladus' total grain production rate and a global profile of uncharged nanograins in the plume. Allowing for the different time scales for dust and plasma dynamics the dust simulations of the plume and the plasma simulations with A.I.K.E.F. for plasma-plume interaction are implemented iteratively.