Geophysical Research Abstracts
Vol. 12, EGU2010-4477, 2010
EGU General Assembly 2010

Inferring comet nucleus outgassing from in situ coma composition measurements

Johan De Keyser, Ingrid Mann, and Herbert Gunell
Belgian Institute for Space Aeronomy, Brussels, Belgium (johandk@aeronomie.be, 0032-2-3730368)

Cometary coma composition depends on the details of the chemically reacting outflow from the comet nucleus. This problem has been classically studied by numerical simulation of the reaction kinetics along streamlines, for given volatile composition and outgassing rates on the surface of the comet nucleus. A prerequisite for such simulations is a sufficiently detailed knowledge of the chemical network and the reaction rate constants as a function of temperature, as well as the flow field. In the context of the measurements that will be performed by the ROSINA mass spectrometer on board of the ESA/Rosetta spacecraft once it arrives at its target comet Churyumov-Gerasimenko, we have studied the inverse problem: Given measurements of the abundances of certain species at a number of places in the coma, we determine the outgassing rates and source composition. This inverse problem requires solving a hard nonlinear optimization problem. In a next step, we demonstrate how this enables us to produce maps of the nucleus with outgassing rates and source composition by compiling observations as Rosetta orbits the rotating comet nucleus. It would be of utmost scientific interest to compare such ROSINA maps with data from other instruments on Rosetta.