Geophysical Research Abstracts
Vol. 19, EGU2017-11583, 2017
EGU General Assembly 2017

3-D Retrieval of Global Outgassing Rate for Comet 67P/Churyumov-Gerasimenko from Microwave Instrument on the Rosetta Orbiter (MIRO) Spectroscopic Data

Paul von Allmen, Seungwon Lee, and the MIRO Team
Jet Propulsion Laboratory, Pasadena, United States (pva@jpl.nasa.gov)

Water H216O and H218O molecular line spectra have been routinely used to derive the global outgassing rate of comet 67/ Churyumov-Gerasimenko. Most of the coma models used for these retrievals assume a spherical gas distribution even though observational data clearly shows that the coma is strongly asymmetric, especially at close range from the nucleus. This approximation is probably only valid for observations from large distances from the comet. We will present a detailed study of several raster scan observational datasets obtained with MIRO, using a full 3-D coma model for the retrieval of the global outgassing rate. The Inner Coma Maps (ICM) were obtained by scanning the MIRO antenna across the coma region close to the nucleus and recording the radiance for the water 1(10)-1(01) line. A 3-D collisionless model is used to compute the distribution of the water density, velocity and temperature in the coma. Neglecting molecular collisions is a good approximation when the heliocentric distance of the comet is relatively large (larger than about 2 AU). The model uses a realistic numerical shape model for the nucleus and assumes that the water outgassing is modulated by the solar illumination of the surface of the nucleus and a local factor that describes potential inhomogeneity in the efficiency of the outgassing. The water molecular line is computed using a 3-D non-local thermal equilibrium radiative transfer model. The local outgassing efficiency parameter in the model is adjusted to fit the MIRO data. The global outgassing rate is obtained by integrating the local outgassing over the surface of the nucleus.