



Line Shape Analysis and Abundance Quantification for Methanol in the Comet 67P/Churyumov-Gerasimenko Coma Derived from Microwave Instrument on the Rosetta Orbiter (MIRO) Observations

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Since early summer 2014, the Microwave Instrument on the Rosetta Orbiter (MIRO) has been measuring emission from the coma of 67P/Churyumov-Gerasimenko in the sub-millimeter channel at 562 GHz and the millimeter channel at 190 GHz. The high-resolution spectrometer in the sub-millimeter channel is tuned to molecular lines of H₂O, CO, CH₃OH and NH₃. We will discuss the analysis of the three methanol lines at 553.146 GHz, 568.566 GHz and 579.151 GHz and present gas abundance and rotational temperature estimates. The line shape analysis relies on our non-local thermal equilibrium radiative transfer software package. Some of the key parameters needed to determine the population of the rotational levels, which enter the radiative transfer calculation, are the collision coefficients with the water molecules. We have calculated the methanol-water molecular collision coefficients using a dipole-dipole interaction Hamiltonian and first order perturbation approximation for the collision process and will present results in the relevant ranges of gas temperature and density.