Constraining Volatile Abundances in Comet C/2004 Q2 (Machholz)

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Spectroscopic observations of comets provide an important tool to understand their chemical composition. We aim to determine the outgassing and mixing ratios of parent volatiles in comet C/2004 Q2 (Machholz). The line emission from several molecules in the inner cometary atmosphere is measured at heliocentric distance of 1.2 AU by means of high-resolution spectrospic observations using the Arizona Radio Observatory Submillimeter Telescope (SMT). The detection of several parent volatiles (CH₃OH, HCN, CO and CS) suggest a processing history similar to other Jupiter-family comets. Furthermore, multiline observations of CH₃OH allows for a more reliable estimate of production rates using a molecular excitation code. We obtain production rates and excitation temperatures for several molecules from simulations of the line profiles using a radiative transfer code based on the accelerated lambda iteration method.

Keywords: Comets; Radiative transfer; Methods: Numerical;