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Remote sensing of a comet nucleus with Rosetta/ROSINA in-situ coma measurements.

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Rosetta will rendez-vous with comet 67P/Churyumov-Gerasimenko in 2014 and will, among other tasks, study the physicochemical evolution of the cometary coma from onset of activity at large solar distances through perihelion at 1.2 AU. The Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA) allows the determination of both neutrals and positive ions in the coma.

This research effort is focused on using in situ gas density measurements at small distances from the nucleus to get information about gas production rates and volatile composition at the nucleus, which reveals information about the nucleus and its origin. Furthermore, if sufficient data is available, a 2D activity map of the nucleus surface can be created and inputs concerning the nucleus surface can be valuable to assist in finding a suitable landing location for Philae, the Rosetta lander.

The volatile outgassing rate and the surface composition at the nucleus can be accurately determined from in situ coma composition measurements provided accurate information is available concerning solar activity, the flow field and reactions that transform the neutral gas as it expands outward (e.g. photo-ionization). This contribution describes the principle of the data inversion technique and illustrates it with model data.