WHAT CAN WE EXPECT FROM THE IN SITU CHEMICAL INVESTIGATION OF A COMETARY NUCLEUS BY GAS CHROMATOGRAPHY ?

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As part of the Surface Science Package of the ESA Rosetta mission (2003), the COmetary Sampling And Composition experiment (COSAC) is designed to in situ chemical investigation of the comet 46/P Wirtanen nucleus. It includes a gas chromatographic (GC) subsystem dedicated to the separation, the identification and the quantification of the chemical species provided by the heating of the nucleus material introduced in coupled micro ovens. During the development of the experiment, we studied, optimised and selected the most appropriate GC columns (heart of the GC) dedicated to the general chemical characterisation of the nucleus, to meet the specific instrumental, space environmental and scientific requirements. In order to evaluate the analytical capabilities of the instrument once present onto the cometary nucleus surface, the COSAC gas chromatographic system (including the flight columns and their detector) and the in situ operating conditions were reproduced at the laboratory. Several series of calibration using compounds of cometary interest were then performed and showed the ability of the instrument to identify a wide range of new cometary species. This conclusion was reinforced by the detection of compounds during the analysis of cometary analogues samples with one of the flight columns. The aim of this presentation is to describe the COSAC experiment with an emphasis on the GC subsystem design and characteristics, and mainly to present the results dealing with the columns and the detectors of the subsystem which demonstrate the capability of the instrument to identify new cometary species. Beyond the development of the instrument and the estimation of its analytical properties, such results should be used to the treatment and the interpretation of the data collected in situ which could open, in the future, new perspectives in cometary sciences.