

24 September 2015

Media Release

EMBARGOED UNTIL FRIDAY 25 SEPTEMBER 2015 20:00 CEST

Rosetta's mass spectrometer ROSINA detected argon at comet Churyumov-Gerasimenko

The mass-spectrometer ROSINA on ESA's comet probe Rosetta has for the first time detected the noble gas argon in the coma of 67P/Churyumov-Gerasimenko. This measurement adds to the debate about the role of comets in delivering various «ingredients» to Earth such as water.

Comets are considered to be representative of icy planetesimals that may have contributed a significant fraction of the volatiles to planets in the very early solar system. It is also believed that comets must have brought some water to the Earth, however, the magnitude of their contribution is still a matter of debate. Hans Balsiger from the Physics Institute at the University of Bern and his team were now able to detect the noble gas argon in the coma of comet 67P/Churyumov-Gerasimenko – it is for the first time that researchers were actually able to measure this particular gas on a comet. Although the abundance-range of argon to water was quite large, it could be used to investigate the question of whether comets brought water to Earth, Balsiger explains: «The argon-to-water ratio on Earth is several magnitudes lower than observed at 67P/C-G. If it were the same here on Earth as on the comet, we'd have far greater quantities of argon in our atmosphere.» The results of the study which is part of ESA's Rosetta comet mission were published in the journal «Science Advances».

Research confirms earlier results provided by ROSINA

One of the main goals of the Rosetta mission is to measure in situ the volatile inventory of 67P, a so-called Jupiter family comet. The tool used to perform these measurements is called ROSINA, a mass spectrometer built at the University of Bern. It has a high sensitivity and a high mass resolution, which allows the comparison to remote sensing observations and to the only previous in-situ measurement at comet Halley in 1986. According to Balsiger informations such as those

provide by ROSINA could not be obtained from meteorites collected on Earth which were the only source of deep-space samples till now available for investigations.

In October 2014 ROSINA detected two isotopes of argon during a fly by at a distance of only 10 kilometers from «Chury's» surface. During a period of four days researchers compared the abundance of argon with that of other molecules in the coma. «The outcome of this estimate is that contributions from comets such as 67P to the Earth's oceans are, if at all, very small», Balsiger comments. Earlier data provided by ROSINA about the ratio of hydrogen and deuterium on the comet already pointed in that direction (see our media release from 10 December 2014).

In situ noble gas measurements are important complements to the measurements of deuterium in water and the nitrogen molecules in the coma of 67P. They furthermore address the question of formation temperature of the comet's original material; icy grains that formed the planetesimals 4.5 billion years ago in the very cold regions of our solar system beyond the orbit of Neptune.

Publication details:

H. Balsiger, K. Altwegg, A. Bar-Nun, J.-J. Berthelier, A. Bieler, P. Bochsler, C. Briois, U. Calmonte, M. Combi, J. De Keyser, F. Dhooghe, P. Eberhardt, B. Fiethe, S. A. Fuselier, S. Gasc, T. I. Gombosi, K. C. Hansen, M. Hässig, A. Jäckel, E. Kopp, A. Korth, L. Le Roy, U. Mall, B. Marty, O. Mousis, T. Owen, H. Rème, M. Rubin, T. Sémon, C.-Y. Tzou, J. H. Waite, P. Wurz, «*Detection of argon in the coma of comet 67P/Churyumov-Gerasimenko*», Science Advances, 2015

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