From Giotto to Rosetta, the search for the origin of the solar system material with in situ mass spectrometry at comets

The Neutral Mass Spectrometer NMS on the Giotto spacecraft to comet Halley in 1986 had a mass range from 12u to 32u [1]. This already tells that the main goals of the Giotto mission were the verification that comets indeed consist of a solid nucleus which contains according to [2] water ice and dust. The fact, that the mass spectrometers on board Giotto showed, apart from water, numerous signatures of more volatile compounds like CO and CO₂ and of heavy organics, was one of the big surprises of this mission. The detection of formaldehyde, methanol, acetaldehyde, to name only a few identified compounds, made people aware that comets may be real treasures with respect to the origin of the solar system material. Elemental abundances confirmed that comets are the most primitive bodies in the solar system. The high deuterium abundance detected in cometary water e.g. [3] pointed to an origin of water from before the solar system formation. In this talk we will explore the scientific impact of comets on our understanding of the solar system formation and evolution and we will follow the Rosetta mission from launch in 2004 up to the exciting times just ahead when Rosetta will rendezvous with comet Churyumov-Gerasimenko and put a lander on its surface in a few weeks from now.

References: