First Results on Outer Planets Observations with Herschel

P. HARTOGH[1], J. CROVISIER[2], E. LELLOUCH[2] and THE HSSO TEAM
[1]*Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany*
[2]*LESIA, OBSERVATOIRE DE PARIS, Meudon, France*

The HssO (Herschel solar system Observations) program aims at determining the distribution, the evolution and the origin of water in Mars, the Outer Planets, Titan, Enceladus and comets, using the three Herschel instruments HIFI, PACS and SPIRE. It addresses the broad topic of water and its isotopologues in planetary and cometary atmospheres. The nature of cometary activity and the thermodynamics of cometary comae will be investigated by studying water excitation in a sample of comets. The D/H ratio, the key parameter for constraining the origin and evolution of Solar System materials, will be measured for the first time in a Jupiter family comet. A comparison with existing and new measurements of D/H in Oort cloud comets will constrain the composition of pre-solar cometary grains and possibly the dynamics of the protosolar nebula. New measurements of D/H in Giant Planets, similarly constraining the composition of proto-planetary ices, will be obtained. The D/H and other isotopic ratios, diagnostics of the evolution of Mars atmosphere, will be accurately measured in H_2O and CO. The role of water vapour in the atmospheric chemistry of Mars will be studied by monitoring vertical profiles of H_2O and HDO and by searching for several other species (including CO and H_2O isotopologues). A detailed study of the source of water in the upper atmosphere of the Giant Planets and Titan will be performed. By monitoring the water abundance, vertical profile, and input fluxes in the various objects, and when possible with the help of mapping observations, we will discriminate between the possible sources of water in the Outer Planets (interplanetary dust particles, cometary impacts, and local sources). First results on the Outer Planets observations will be presented in this talk.

References

[1] P. Hartogh et al., *Planet. Space Sci.,* **57**, 1596-1606, doi:10.1016/j.pss.2009.07.09, 2009.