

Observations of ammonia in comets with Herschel

N. Biver¹, D. Bockelée-Morvan¹, P. Hartogh², J. Crovisier¹, M. de Val-Borro³, M. Kidger⁴, M. Küppers⁴,
D. Lis^{5,6}, R. Moreno¹, S. Szutowicz⁷, and the HssO Team²

¹LESIA, Observatoire de Paris, CNRS, UPMC, Université Paris-Diderot, 5 place Jules Janssen, F-92195 Meudon, France

²Max Planck Institut für Sonnensystemforschung, 37073 Göttingen, Germany

³Department of Astrophysical Sciences, Princeton University, Princeton, NJ, USA

⁴ESAC, Villafranca del Castillo, Spain

⁵California Institute of Technology, Cahill Center for Astronomy and Astrophysics 301-17, Pasadena, CA 91125, USA

⁶LERMA, Observatoire de Paris, CNRS, Sorbonne Universités, UPMC, F-75014 Paris, France

⁷Space Research Centre, PAS, Warszawa, Poland

Ammonia is the most abundant nitrogen bearing species in comets. However, it has been scarcely observed in comets due to the weakness of the lines observable from the ground at infrared and centimetre wavelengths. Nevertheless, its main photodissociation product NH_2 has been observed in several comets in the visible. The fundamental rotational $J_K = (1_0 - 0_0)$ transition of NH_3 at 572.5 GHz has been observed in comets since 2004, with the Odin satellite (Biver et al. 2007). In the frame of the Herschel guaranteed time key program "HssO" (Hartogh et al. 2009), ammonia was detected with the HIFI instrument in comets 10P/Tempel 2 (Biver et al. 2012), 45P/Honda-Mrkos-Pajdusakova, 103P/Hartley 2, and C/2009 P1 (Garradd). The hyperfine structure of the line is resolved. We have built a complete excitation model to interpret these observations, including the radial distribution in comet 103P. The derived abundances relative to water are on the order of 0.5 %, similar to the values inferred from visible observations of NH_2 .

References: Biver, N., Bockelée-Morvan, D., Crovisier, J., et al. 2007, P&SS, 55, 1058; Biver, N., Crovisier, J., Bockelée-Morvan, D., et al. 2012, A&A, 539, A68; Hartogh, P., Lellouch, E., Crovisier, J., et al. 2009, P&SS 57, 1596.