Search for ammonia in comet C/2012 S1 (ISON)

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Comets are pristine bodies of the Solar System and their studies can give precious hints on the formation of the Solar System itself. New comets, coming form the Oort Colud at their first passage close to the Sun, are particularly important, because they are not differentiated by the Solar radiation and they are supposed to have a large quantity of organic matter close to the surface.

Here we report the results of a search for NH_3(1,1) emission at 23.7 GHz in comet C/2012 S1 ISON using a new dual-feed K-band receiver mounted on the Medicina 32-m antenna. We observed the comet once close to its perihelion, from 2013 Nov. 25 to Nov. 28, when its heliocentric distance changed from 0.25 au to 0.03 au. We integrated about 6 hrs per day, obtaining high-spectral-resolution (1 km/s) spectra with a typical rms noise of 10 mK. Such sensitivity allowed us to derive an upper limit of $Q(NH_3)$ of about 2.5 $\times 10^{29}$ mol/s on November 26. This upper limit would correspond to a $Q(H_2O)$ of about 2.5 $\times 10^{31}$ mol/s, assuming the typical $Q(H_2O)/Q(NH_3)$ ratio of 100. These findings confirm that no significant $Q(H_2O)$ enhancement happened near the perihelion, consistent with a definitive decrease of molecules production rate.