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CO Upper Limits on Jupiter's Atmosphere After the July 2009 Impact

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We report a search for carbon monoxide in Jupiter's atmosphere after the impact of July 19th 2009 with the IRAM-30m telescope (Pico Veleta, Spain)

The CO (2-1) rotational line (at a frequency of 230.538 GHz) has been observed on the new impact on Jupiter, on July 24th and 27th 2009 (i.e. $\sim$5, and 8 days after the impact) without any clear CO (2-1) detection. The rms in antenna temperature was about 0.06 K. For comparison, the same rms was measured in July 1994 on the medium impact site E from comet SL9. On October 29th 2009, we tried again to search for CO, having in mind that the dispersion would increase the emitting size and favour the CO detection. Nevertheless, this last measurement did not detect CO either.

Taking into account the estimated impact size on July 20th (11° in longitude and 5.5° in latitude), we ran several radiative transfer model of Jupiter's atmosphere. With stratospheric temperatures taken between 162 and 165 K at pressures less than 0.1 mbar, we found a 2-sigma upper limit of CO mass of 1 x 10^{13} and 6 x 10^{13} g, respectively. Assuming that CO is formed by shock chemistry, these upper limits correspond to a cometary (icy) impactor diameter less than 320 or 575 m, respectively.