



Submillimeter mapping of mesospheric minor species on Venus with ALMA

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ALMA offers a unique opportunity to map mesospheric species on Venus. During Cycle 0, we have observed Venus on November 14 and 15, 2011, using the compact configuration of ALMA. The diameter of Venus was 11 arcsec and the illumination factor was about 90 percent. Maps of CO, SO, SO₂, and HDO have been built from transitions recorded in the 335-347 GHz frequency range. The mesospheric thermal profile has been inferred using the CO transition at 345.795 GHz. From the integrated spectrum of SO recorded on Nov. 14 at 346.528 GHz, we find that the best fit is obtained with a cut-off in the SO vertical distribution at about 88 km and a mean mixing ratio of about 8.0 ppb above this level. In the case of SO₂, as for SO, we find that the best fit is obtained with a cut-off at about 88 km; the SO₂ mixing ratio above this level is about 12 ppb. The map of HDO is retrieved from the 335.395 GHz transition. Assuming a typical D/H ratio of 200 times the terrestrial value in the mesosphere of Venus, we find that the disk averaged HDO spectrum is consistent with a H₂O mixing ratio of about 2.5 ppm, constant with altitude. Our results are in good agreement with previous single dish submillimeter observations (Sandor and Clancy, *Icarus* 177, 129, 2005; Gurwell et al. *Icarus* 188, 288, 2007; Sandor et al. *Icarus* 208, 49, 2010; *Icarus* 217, 836, 2012), as well as with the predictions of photochemical models (Zhang et al. *Icarus* 217, 714, 2012).