# Observations of Venus with ALMA

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**Résumé**

The study of the composition of the upper mesosphere of Venus is necessary to characterize several atmospheric processes such as photochemistry, condensation and dynamics. At this altitude level (80-110 km), several species have been detected thanks to their (sub)millimeter rotational lines, in particular sulfur species SO2 and SO, that may be indicative of Venus' volcanic activity, and showed an abundance increase with altitude suggesting a local sulfur-bearing aerosol source. H2O, which takes part in the formation of H2SO4 clouds, was also detected as well as its isotope HDO; their analyses revealed significant diurnal and long-term temporal variations.
To explore this case in greater detail and better assess local, diurnal and temporal variations of minor species, heterodyne spectroscopic observations were obtained in November 2011 during the first Early Science observation cycle of the Atacama Large Millimeter Array (ALMA), the largest (sub)millimeter interferometer, which at the time offered 16 12-m large antennas. These observations allowed us to map the day side of Venus with a spatial resolution down to 1.2-2.4"" (for a disk of 11"), targeting SO2, SO, HDO and CO transitions around 0.85mm (335-346 GHz).
All of these transitions were well detected and their modeling yielded abundances consistent with previous single-dish assessments. We will present a detailed analysis of the data in terms of spatial distribution (horizontal and vertical) and temporal variations, and we will discuss their interpretation with regard to the efficiency of photochemical destruction in the mesosphere and aerosol sources. In addition, by mapping the CO(3-2) line's Doppler-shifts, we have been able to derive the wind field near the upper boundary of the mesosphere, whichs corresponds to a region of dynamic transition between the retrograde zonal wind regime of the troposphere and the subsolar-to-antisolar flow that dominates at higher altitudes.

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