

Characterizing atmospheric composition and trace species variability in the atmosphere of Venus with ALMA

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Abstract: The surface of Venus is covered with volcanic features and most of its crust is of volcanic origin. Despite many signs that volcanoes may be active in the present on Earth's twin planet, no direct evidence of present volcanic activity has been found thus far. On the one hand, the surface of Venus is hidden from direct observation by its thick cloud layer. The clouds are formed by H₂SO₄ droplets and reflect most of the incoming solar radiation back to space. Clouds, their effect on the radiative balance of the atmosphere, and the sulfur cycle are thus intimately related. SO₂, SO and CO are some of the gases that may originate in active volcanism and which, combined with water vapor, intervene in the cloud formation process. Recent detections of long-term variability of atmospheric SO₂, in particular, are indicative that there may be active sources at the crust in the present.

In this project the student will carry out and analyze observations with the ALMA (Atacama Large Millimetre Array), with the objective of characterizing variations of atmospheric composition between 70 and 100 km altitude, in particular for water vapor and trace species of possible volcanic origin. Mapping the atmospheric composition of the Venusian mesosphere and its variability using the high spatial resolution allowed by ALMA (up to 1 arcsec), will allow to characterize the water and sulfur cycles and to infer possible volcanic activity or other phenomena with a direct influence on atmospheric composition.

The planetary atmospheres group of CAAUL collaborates with a large number of international teams in space sciences. The selected candidate is expected to be proficient in written and spoken English, have excellent communication skills and availability to travel. Applications to PhD theses in association with other European universities or to European PhD theses are encouraged. Candidates will have support from CAAUL for applying to research studentships.