Geophysical Research Abstracts
Vol. 21, EGU2019-17644, 2019
EGU General Assembly 2019

VenSpec-H, infrared spectrometer onboard EnVision to study Venus' volcanism

Séverine Robert (1), Ann Carine Vandaele (1), Eddy Neefs (1), Lars Jacobs (1), Sophie Berkenbosch (1), Ian R. Thomas (1), Joern Helbert (2), Emmanuel Marcq (3), Colin Wilson (4), Thomas Widemann (5), and Richard Ghail (6)

(1) Royal Belgian Institute for Space Aeronomy, Brussels, Belgium (severine.robert@aeronomie.be), (2) German Aerospace Center (DLR), Berlin, Germany, (3) LATMOS, Université de Versailles Saint-Quentin, France, (4) Dept. of Physics, Oxford University, Oxford, UK, (5) Université Paris-Saclay, Observatoire de Paris, LESIA, Meudon, France, (6) Dept. of Earth Sciences, Royal Holloway, University of London, UK

The VenSpec-H instrument is part of the EnVision M5 mission payload which has been selected by ESA to enter Phase A in January 2019 for a potential mission selection in 2021. EnVision is a medium class mission to determine the nature and current state of geological activity on Venus, and its relationship with the atmosphere, to understand how Venus and Earth could have evolved so differently. VenSpec-H is based on NOMAD (Nadir and Occultation for MArs Discovery), a suite of three spectrometers on ExoMars Trace Gas Orbiter. Specifically, VenSpec-H is a redesign of the LNO (Limb, Nadir and Occultation) channel of NOMAD, retaining much heritage from the original but with minor modifications to meet the science objectives of the EnVision mission.

VenSpec-H is part of the VenSpec suite, including also an IR mapper and a UV spectrometer suite. The science objectives of this suite is to (i) search for temporal variations in surface temperatures and tropospheric concentrations of volcanically emitted gases, indicative of volcanic eruptions and (ii) study surface-atmosphere interactions and weathering by mapping surface emissivity and tropospheric gas abundances.

Recent and perhaps ongoing volcanic activity has been inferred in data from both Venus Express and Magellan. Maintenance of the clouds requires a constant input of H_2O and SO_2. A large eruption would locally alter the composition in the following way: (i) increase H_2O by several tens of percent; (ii) decrease D/H ratio by several tens of percent and (iii) increase SO_2 by about a few percents. The latter effect is probably underestimated with respect to the others, since the Venusian interior is thought to be much drier than Earth's, so that the outgassed SO_2/H_2O ratio may be much higher on Venus. Observations of changes in lower atmospheric SO_2 and H_2O vapour levels, cloud level H_2SO_4 droplet concentration, and mesospheric SO_2, are therefore required to link specific volcanic events with past and ongoing observations of the variable and dynamic mesosphere, to understand both the importance of volatiles in volcanic activity on Venus and their effect on cloud maintenance and dynamics.

To contribute to this investigation, VenSpec-H will be designed to (i) measure H_2O and HDO contents in the first scale height of Venus' atmosphere, using the 1.18μm spectral window and (ii) probe H_2O, HDO, OCS, SO_2 in the 30 to 40 km altitude range, using the 2.4μm spectral window. How spectral simulations and determination of Signal-to-Noise ratios led to the design of the instrument will be presented in this communication.