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EnVision: An ESA Medium-class mission to Venus in collaboration with NASA

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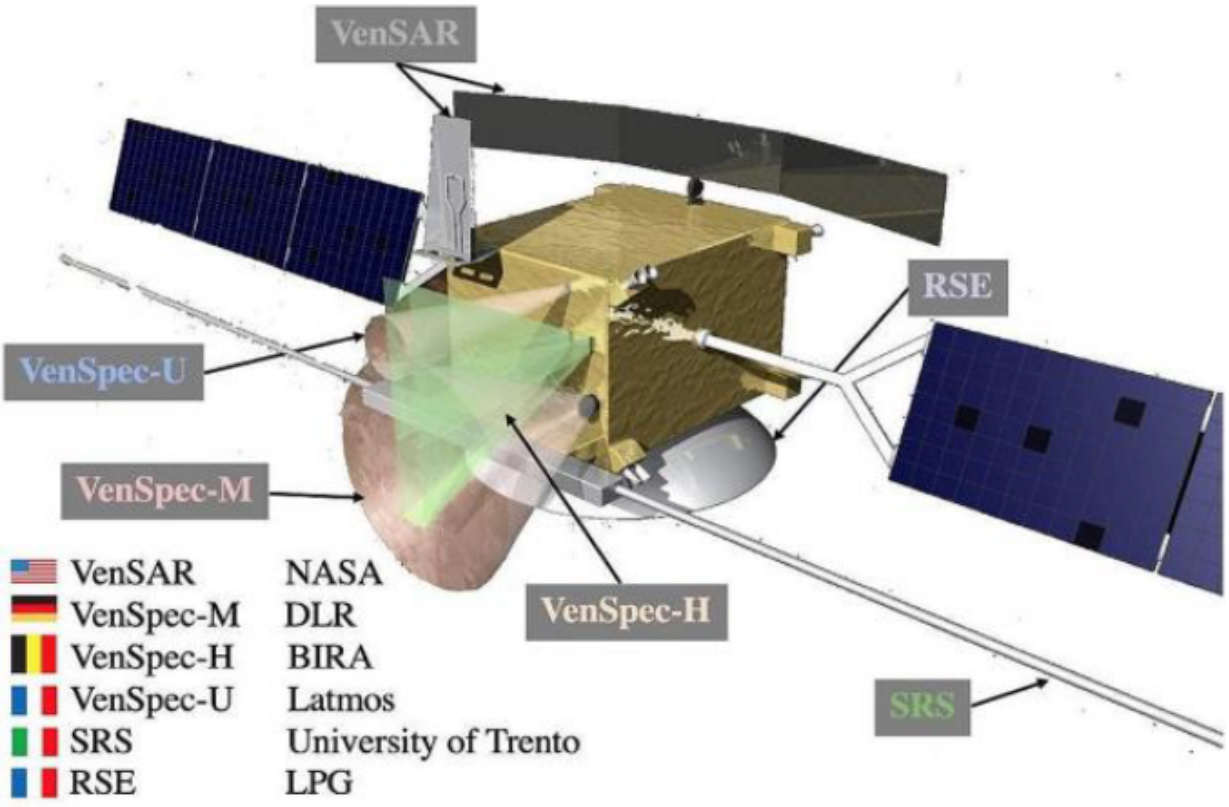
EnVision is a Venus orbiter mission that will determine the nature and current state of geological processes on Venus in the present era, measure how those processes generate and sustain the inhospitable atmosphere and climate of Venus, and piece together the sequence of events – the geological history – that led to that current state. Envision was selected in June 2021 to become the next M-Class mission of ESA's Cosmic Vision Programme. To full fill the science objectives, EnVision employs a suite of instruments optimised for observations from Venus orbit, including an imaging radar for high-resolution surface mapping (provided by NASA), a sounding radar for discerning the geometry of the near subsurface, a multispectral infrared camera capturing the composition of surficial rocks and atmospheric composition, and an infrared and ultraviolet spectrometer, complemented by radio science experiments, to identify the pathways of important volcanogenic gases (water vapour, sulphur dioxide, and others) from the lower atmosphere up and into the clouds and in the upper atmosphere. The radoscience experiment also exploits the precise orbit determination to measure the gravity field and probe the deep interior structure of Venus. Figure 1 shows the instrument payload integrated onto the spacecraft and the country and organization responsible for each payload element. The Synthetic Aperture Radar, VenSAR, will image pre-selected regions of interest at a resolution of 30 m/pixel, and subregions at 10 m/pixel. EnVision will be the first Venus mission hosting a Subsurface Radar Sounder, SRS, characterizing the vertical structure and stratigraphy of geological units including volcanic flows. The spectrometer suite, VenSpec, will obtain global maps of surface emissivity in six wavelength bands using one ultraviolet on the dayside, and five near-infrared spectral transparency windows in the nightside atmosphere, to constrain surface mineralogy and inform evolutionary scenarios; and measure variations of SO2, SO and linked gases in the mesosphere. These variations will be further linked to tropospheric variations and volcanism. The Radio Science Experiment uses the spacecraft-Earth radio link for gravity mapping and atmospheric profiling. EnVision is planned to be launched on an Ariane 62 in 2031 with back-up launch dates in 2032 and 2033. An interplanetary cruise is followed by orbit insertion and then circularisation by aerobraking to achieve the nominal science orbit, a low quasi-polar Venus orbit. NASA is contributing the VenSAR instrument and supplies DSN support. The other payload instruments are contributed by ESA member states, with ASI, DLR, BelSPO, and CNES leading the procurement of SRS, VenSpec-M, VenSpec-H, the USO and VenSpec-U instruments respectively.

Figure 1 EnVision' s payload instruments integrated onto the spacecraft


VenSAR
RSE
VenSpec-U
VenSpec-M
VenSpec-H
SRS
VenSAR NASA
VenSpec-M DLR
VenSpec-H BIRA
VenSpec-U Latmos
SRS University of Trento
RSE LPG