



## The Venus Entry Probe: a Cosmic Vision mission proposal

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After a long hiatus, Venus is once again being visited by a spacecraft, in the form of Venus Express. This will be followed by more orbiters: Japan's PLANET-C and NASA's possible 'Vesper' orbiter. However, many of the outstanding questions on Venus can only be answered with in situ measurements. Therefore we propose a European in situ mission, currently titled the Venus Entry Probe mission, to address the science goals that can not be addressed by remote sensing investigations, in particular: 1) Study of the isotopic composition, especially that of noble gases, which preserve a record of origin and evolution of Venus. 2) Measurements of chemical composition below the clouds with both vertical and horizontal sampling capabilities in order to characterize in detail the present chemical cycles. 3) Investigation of the surface composition and mineralogy at several locations representing the main types of Venus landforms. 4) In situ investigation of the atmospheric dynamics, structure, and radiative balance. 5). Study of the composition and optical properties of the cloud layer at different altitudes and locations. 6) Characterization of solar wind- atmosphere interaction processes and measurement of atmospheric escape, 7) characterization of the electromagnetic wave activity at Venus (including search for lightning).

The baseline mission under study includes **multiple descent probes**, needed to address the spatial variability of chemical processes and reach the surface at multiple lo-

cations; a **cloud-top altitude balloon** with a lifetime long enough to complete at least one full rotation of Venus; 20x balloon-deployed **microprobes** which would obtain multiple vertical profiles through the dynamic cloud layer; a Japanese **low-altitude balloon** floating under the cloud at  $\sim 35$  km height; an **orbiter** for data relay and context measurements. An option being studied is an **atmospheric sample return**, utilising the ballistic return trajectory of the cruise vehicle; although this adds technical complexity, it enables ground-based high-precision isotopic ratio measurements of oxygen and other key isotopes.