



European Venus Explorer : an in-situ mission to Venus using a balloon platform

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The European Venus Explorer (EVE) mission was proposed to the European Space Agency in 2007, as an M-class mission under the Cosmic Vision Programme. Although it has not been chosen in the 2007 selection round for programmatic reasons, the EVE mission may serve as a useful reference point for future missions, so it is described here. It consists of one balloon platform floating at an altitude of 50-60 km, one descent probe provided by Russia, and an orbiter with a polar orbit which will relay data from the balloon and descent probe, and perform science observations. The balloon type preferred for scientific goals is one which oscillates in altitude through the cloud deck. To achieve this flight profile, the balloon envelope contains a phase

change fluid, which results in a flight profile which oscillates in height. The nominal balloon lifetime is 7 days - enough for one full circumnavigation of the planet. The descent probe's fall through the atmosphere takes 60 minutes, followed by 30 minutes of operation on the surface. The key measurement objectives of EVE are: (i) in situ measurement from the balloon of noble gas abundances and stable isotope ratios, to study the record of the evolution of Venus; (ii) in situ balloon-borne measurement of cloud particle and gas composition, and their spatial variation, to understand the complex cloud-level chemistry; (iii) in situ measurements of environmental parameters and winds (from tracking of the balloon) for one rotation around the planet, to understand atmospheric dynamics and radiative balance in this crucial region. The portfolio of key measurements is complemented by the Russian descent probe, which enables the investigation of the deep atmosphere and surface.