Studying volcanism and surface composition of Venus with the highly integrated Venus Emissivity Mapper suite

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The Venus Emission Mapper (VEM) instrument suite consists of two channels – VEM-M and VEM-H. VEM-M is a multispectral infrared imager with strong heritage from the MERTIS instrument on BepiColombo, while VEM-H is high-resolution, nadir-pointing, infrared spectrometer with strong heritage from SOIR on VenusExpress.

VEM-M can provide global compositional data on rock types, weathering, and crustal evolution by mapping the Venus surface in five atmospheric windows. We use additional filters for the removal of clouds, water, and stray light. VEM-M leverages the approach pioneered by VIRTIS on Venus Express that used narrow-band atmospheric windows, but with an order of magnitude higher sensitivity and fuller spectral and spatial coverage.

VEM-H will be dedicated to extremely high-resolution atmospheric measurements. The main objective of the VEM-H channel is to detect and quantify SO_2, H_2O and HDO in the lower atmosphere, to enable characterisation of volcanic plumes released from the surface of Venus. VEM-H is observing through the 1µm, 1.7µm, and 2-2.3µm atmospheric windows, where viewing the lower atmosphere is possible.

VEM-H complements VEM-M by providing information one Venus' surface and near-surface activity. VEM follows a highly integrate payload concept. Both instrument channels will use a common MERTIS derived instrument controller and power supply unit and will be integrated in a common housing. Due to the different optical requirements the instrument channels use separate apertures and optics that allow maximizing the performance while giving only a marginal mass penalty.

In the combination of both channels VEM will provide unprecedented insights into the current state and the evolution of Venus. VEM will perform a comprehensive search for volcanic activity by targeting atmospheric signatures, thermal signatures and compositional signatures. It will provide a map of the surface composition that will help us to understand the geology of Venus. This mapping will also enable a more informed landing site selection for future missions to Venus.