



Surface Science from ESA's EnVision mission to Venus

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The Magellan mission provided near global imagery of Venus that has facilitated a wealth of observations and discoveries the over past 3 decades, and continues to do so. This work raised a multitude of questions which are unanswerable without further, more detailed and targeted observations of Venus. These unknowns include the current state and rates of geological activity, the nature and mechanisms of heat exchange between interior and exterior, and the existence of active weathering and erosion cycles. A series of nested observations is now required, at a range of scales and resolutions, and these will be provided by Synthetic Aperture Radar (SAR) imagery and polarimetry, Interferometric SAR (InSAR) products, Sub-Surface Radar Sounding, Near Infra-Red (NIR) imaging spectroscopy and thermal emissivity mapping. Though Magellan provided evidence of past surface geological complexity, and whilst InSAR was successfully attempted using Magellan imagery, no measure of current 'tectonic' activity has thus far been achieved. Differential InSAR (DInSAR) change detection is therefore needed to determine rate and nature of geological activity at the Venus surface. Venus Express provided tantalising evidence of active volcanism in the form of surface thermal anomalies at known volcanoes and dynamic atmospheric SO₂ content. Thermal emissivity measurements at high temporal frequency will be used to constrain the rates and character of volcanic activity. Under the high pressure and temperature conditions at the Venus surface, it is likely that the outcropping volcanic rocks will have become severely chemically weathered and perhaps eroded or transported; details in the Venera landers images hint at such surface activity on short time scales. Calibrated polarimetric and high resolution contextual imagery of the Venera landing sites are therefore needed to better understand what the landers imaged. EnVision's imaging suite, of VenSAR, Subsurface Radar Sounder (SRS) and VenSpec-M, will deliver a complementary series of observations to answer these questions.