CORONAE AND LARGE VOLCANOES ON VENUS WITH UNUSUAL EMISSIVITY SIGNATURES IN VIRTIS- VENUS EXPRESS DATA.
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Recent Visual and Infrared Thermal Imaging Spectrometer (VIRTIS) images from the Venus Express mission found emissivity variations on the venusian surface that correlate with some volcanic edifices and coronae [1-3]. Increased emissivity was noted near Quetzalpetlatl Coronae, Atete Corona, Mertseger Mons, Shiwanokia and Shulamite Coronae in Themis Regio, Idunn Mons, Hathor Mons and Ininni Mons. Hathor and Ininni Montes are located on Dione Regio, Idunn Mons on Imdr Regio, and Mertseger Mons is adjacent to Parga Chasma and Themis Regio, and Atete Corona is on Parga Chasma. Mueller et al. [2] note that Themis, Imdr and Phoebe Regiones were classified as active hotspots by [4]. These results are consistent with either unusual compositions or young, unweathered surfaces. Mueller et al. [2] note that the high flux anomaly at young lava flows would support the hypothesis of komatiite or picrite volcanism predicted by [5] as a consequence of chemical differentiation of the upper mantle during the resurfacing event. Smrekar et al. [3] noted that gravitational instability of the lithosphere on a one-plate planet like Venus can create a wide range of melt compositions as the sinking lithosphere may either devolatilize, enriching the upper mantle, or melt itself [6].

In order to explore whether unusual compositions and/or young, unweathered surfaces are causing the emissivity signals, we are assessing some of these sites, focusing first on the features in Themis Regio, as well as Idunn Mons in Imdr Regio. We are evaluating morphologies of volcanism that would indicate more evolved or non-basaltic compositions, and the stratigraphic history of each feature. Through mapping, we are in the process of defining whether young volcanism at the features is potentially present, and/or identify specific volcanic morphologies that might indicate unusual compositions. These morphologies would include channels (e.g., 7), steep-sided domes (e.g., 8, 9), or flows with unusual surface properties (e.g., ridges, high roughness, high reflectivity). As we have limited knowledge of the composition of the surface, we must rely on morphology. However, factors besides composition can control the morphology of volcanic features, including eruption rate, gas content and cooling rate (e.g., 10-12). Therefore, we will interpret unusual volcanic morphologies with caution.

Our initial analysis has focused on Shiwanokia and Shulamite Coronae (Figure 1), expanding our mapping and analysis from the V53 Quadrangle [13]. Shiwanokia Corona is a 500 km diameter concentric corona on the Themis rise. It has two main flow units, which we have mapped as units fS_1 and fS_2. Unit fS_1 is superposed by fS_2 and an impact crater, and is superposed on units several plains units, and flows from Nzambi Corona. Unit fS_2 overlies corona units fS_1, flows from Shiwanokia, Nzambi and Ama Coronae, various plains units, and flows from a volcanic center and Abeona Mons. Shulamite Corona materials (unit fSh) are in contact with flow materials units from six other coronae. Shulamite Corona is a 275 km concentric corona with extensive associated flows. Unit fSh superposes flows from Latta, Tacoma, Erigone, Santa and Rigatona Coronae, and is overlain by flow units fromShiwanokia Corona and a volcanic center. Both coronae have unusual features that merit more detailed study. Shiwanokia has multiple small volcanic edifices superposed on its interior plateau and flanks, including two steep-sided domes. It is cut by a rift, similar to Quetzalpetlatl Corona. Shulamite is also cut by sets of fractures, and has extensive volcanic deposits. Both Shiwanokia and Shulamite Coronae have areas of high reflectivity/low emissivity, based on Magellan data [13].

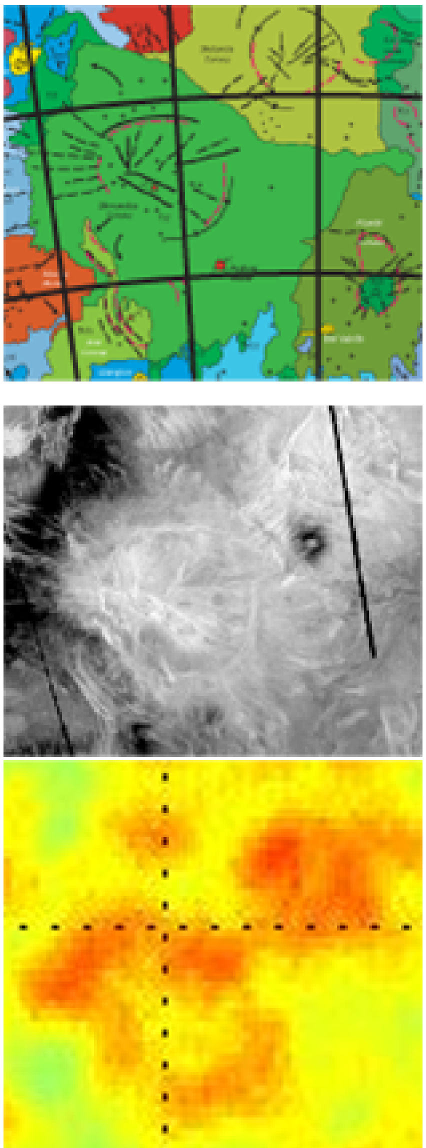

Figure 1. Geologic map (top) [13], Magellan image (center) and VIRTIS data (bottom) of Shiwanokia (lower left)) and Shulamite (upper right) Coronae.

Initial analysis indicates that the regions of high emissivity correlate to the flows surrounding Shiwanokia Corona, while the interior flows of Shulamite also have a high emissivity signature. We hope to constrain whether it is more likely that the unusual emissivity signatures are caused by unusual volcanic compositions, or a relatively young age for these features. This data can be used to help select future landing sites on Venus, as landed missions are likely to be searching for possible unweathered surfaces upon which to make geochemical measurements, or to study unusual compositions that may provide insight into the history of volatiles on Venus (e.g., 14).

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