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sphere, with enhanced heat loss provided at hotspots [15]. Calculations show that the hotspot surface area occupies about 35 times the area of the Hawaiian swell. An additional observation supporting conductive heat loss is that the resurfacing rate of Venus is low; crater statistics suggest a volcanic flux no greater than 2 km^3/yr [16], compared to a value of 17 km^3/yr associated with the generation of oceanic crust on Earth.

Venus: Horizontal Deformation. This tidy picture of the way Venus works was interrupted by the scenes revealed in high resolution radar images from Veneras 15/16 and Arecibo. It is clear that certain regions of the planet have undergone intense tectonic disruption; such deformation is undoubtedly the result of large-scale compressional and extensional horizontal forces [17,18]. What we do not know is the age of the tectonism.

If we cannot find evidence for lithospheric divergence on Venus, then it would be fruitful to demonstrate a link between hotspot tectonism and the postulated large horizontal forces. However, at long wavelengths, where flexural effects may be unimportant, simple compensated uplift of a lithospheric layer will lead to tensional stresses in the "uplands." But there will be no stress in the surrounding "plains," unless the lithosphere starts to creep. This is because the local potential energy anomaly associated with topography is supported by local stresses [19]. Out in the plains there is no potential energy anomaly (or defect). Topographic highs might be expected to spread into the lowlands, particularly by creep in the lower portions of a crust. Such effects, however, cannot be expected to affect the plains more than a distance of approximately the horizontal dimension of the uplift [20].

We can speculate, then, that any link between hotspots (with associated convective flow in the mantle) and horizontal disruption of the lithosphere must be a direct one; i.e., the tectonic response must occur in the same region as the mantle dynamical process. We have proposed [21,22] that direct coupling by convective flow with the lithosphere indeed provides sufficient horizontal stress to induce a significant tectonic response. The magnitude of the response can be estimated directly from free air gravity data. Additionally, it has been suggested that the formation and evolution of Ishtar Terra can be directly related to mantle flow processes [17,23,24]. Alternative scenarios for Ishtar Terra require large scale motion of crust [25], but the driving forces have not been identified. The ridge belts of the northern plains are a possible region of considerable extension [26], but lack the thermal topographic signature associated with lithospheric spreading on the Earth. Alternatively, this activity happened in the geological past, and we are observing the fossilized tectonic remains.

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RADAR SCATTERING FROM DESERT TERRAINS, PISGAH/LAVIC REGION, CALIFORNIA: IMPLICATIONS FOR MAGELLAN; J. J. Plaut, R. E. Arvidson, McDonnell Center for the Space Sciences, Department of Earth and Planetary Sciences, Washington University, St. Louis, Missouri 63130, S. Wall, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, California 91109.

A major component of the 1988 Mojave Field Experiment (Wall et al., 1988) involved the simultaneous acquisition of quad-polarization multi-frequency airborne SAR imaging radar data and ground measurements thought to be relevant to the radar scattering behavior of a variety of desert surfaces. In preparation for the Magellan mission to Venus, the experiment was designed to explore the ability of SAR to distinguish types of geological surfaces, and the effects of varying incidence angles on the appearance of such surfaces. The airborne SAR system acquired images at approximately 10 m resolution, at 3 incidence angles (30°, 40°, 50°) and at 3 wavelengths (P: 68 cm, L: 24 cm, C: 5.6 cm). The polarimetric capabilities of the instrument allow the simulation of any combination of transmit and receive polarizations during data reduction (Zebker et al., 1987; vanZyl et al., 1987). Calibrated trihedral corner reflectors were deployed within each scene to permit absolute radiometric calibration of the image data. We will report on initial analyses of this comprehensive radar data set, with emphasis on implications for interpretation of Magellan data.

Detailed site characterization and sample collection were conducted at 5 compositionally and/or texturally distinct sites within the Pisgah Volcanic Field/Lavic Lake area. These included: a smooth undisturbed playa surface; a playa surface covered with basaltic cobbles; a moderately vegetated alluvial surface; and 2 basaltic lava flow surfaces of contrasting roughness.

Total (unpolarized) backscattered power values are well-correlated with ground determinations of wavelength-scale roughness for the various sites. For example, differences in measured backscattered power between the smooth and cobble-strewn playa surfaces are minor in P-band (< 1 dB) and L-band (<4 dB), but are large (>5 dB) in C-band. This is clearly due to the presence of scattering elements (cobbles) which occur primarily at the scale of the C-band wavelength (5-20 cm). A similar effect is seen at the two lava flow sites. Backscattered power differences between the rough (aa) and less rough (pahoehoe) surfaces are >4 dB in P- and L-band but <2 dB in C-band. In this case the longer wavelength bands are sensitive to the dominant roughness differences of the two sites, while the relatively uniform C-band response results from a common small-scale roughness.

Preliminary analysis of incidence angle effects indicates that all of the surface types exhibit the expected decrease in backscatter strength with increasing incidence angle. Future work will examine this effect in more detail, in the context of model scattering laws. In HH-polarized data, the two playa surfaces are better separated at large incidence angles, as are the aa and pahoehoe lava flows. Near-range (low incidence angle) observations suffer from increased speckle noise and saturation from radar-facing slopes.

Work to be reported in the workshop poster session will address the effects of incidence angle, look azimuth and resolution on distinguishing among units. Future work will utilize the unique polarimetric data, along with absolute calibrations at multiple wavelengths, to develop and test models for inversion of image data for extracting geologically important properties of surfaces.

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