RADAR PROPERTIES OF SEVERAL FLUIDIZED EJECTA BLANKETS ON VENUS; J.R. Johnson and V.R. Baker, Lunar and Planetary Laboratory and Department of Geosciences, Space Sciences Bldg., University of Arizona, Tucson, AZ, 85721.

Magellan SAR imagery, altimetry, and radiometry are being analyzed to characterize the radar properties of the fluidized ejecta blankets (FEBs) that are associated with over 40% of the impact craters on Venus **[1,2,3]**. The FEB flows and plains units surrounding the craters Isabella (175 km), Addams* (90 km), Seymore (65 km), and a crater located at 4°S, 155.5°E (70 km) are examined here using the MIT-produced ARCDR and GxDR data. Individual orbital footprints obtained from the ARCDRs have been classified according to their dominant simple geologic unit (e.g., plains, FEB flows). This permits average values of reflectivity (corrected for diffuse scattering), rms meter-scale slopes, emissivity, and SAR backscatter to be calculated for each unit. GxDR images provide a means of visualizing the spatial relations between the various data sets. Variability of radar properties within the FEBs and relative to surrounding regions may have implications concerning the genesis and possible emplacement mechanisms of fluidized ejecta.

Method. GxDR images of the corrected reflectivity, emissivity, rms slopes and topography data sets were displayed and analyzed with MGMDQE software **[4]** to provide an overview of the relations between these data. More rigorous treatment of the available radar properties requires use of the individual orbital footprint data available in the ARCDRs. Cycle 1 altimetric and radiometric orbital footprints were overlain onto SAR images of the four craters using the MGMDQE software **[4]**. The regions selected for analysis encompassed all crater materials and were bounded north-south by lines of latitude and east-west by orbit tracks. Individual footprints were manually classified according to their dominant simple geologic unit (plains and FEB flow materials are presented here). For each footprint the ARCDR data provided values of corrected reflectivity and its formal error, rms slope and its formal error, average radar backscatter values, emissivity, and the non-range-sharpened goodness-of-fit between the radar echo profiles and the MIT templates derived from Hagfors' function **[5,6]**. Average values and standard deviations about the mean of these parameters were then calculated for each unit. The results are shown for the FEB flows in Table 1 and surrounding plains in Table 2.

Obervations. The GxDR images show that the paths of the FEB flow materials for these four craters appear to follow topography, with distal flows often ponded in depressions. While most flows are often distinguished by their relatively high rms slopes (especially in their more distal portions and terminal ponded units), the correlation is not entirely consistent. For example, high rms slope values (5-7°) in the medial portion of the Addams' flow are followed distally by lower values (1-3°) which are in turn followed by high values (6-9°) at the ponded ends of the flow **[3]**. FEB flows appear as low corrected reflectivity units (e.g., < 0.1) but are less easily distinguished than in the rms slope images. This is again especially noticeable for Addams (although it should be noted that the high latitude location of Addams (56°S) may affect the rms slope and reflectivity Cycle 1 data, [pers. comm., P.Ford, 1992; **[7]**). High emissivities (up to 0.94 for 4S-155.5) distinguish the FEB flows except for Isabella, which shows highest values in the crater interior and intermediate values in the distal flows.

The average radar property values of the plains and FEB flows associated with the four craters presented here (Tables 1 and 2) exhibit several consistent trends. The corrected reflectivities are higher for the plains units in all cases, while the emissivities, average radar backscatter, and rms slopes and their associated formal errors are higher for the flows. In addition, the standard deviations of the rms slopes and their errors are higher for the flows than the plains. The goodness-of-fit parameter is also consistently higher for the FEB flows (i.e., the fit of the observed echo to a Hagfors' function is better).

Discussion. The radar property data suggest that the FEB flows are rougher on both the meter-scale (rms slope) and wavelength-scale (SAR backscatter and emissivity) than the surrounding plains. The flows also have a higher variability of roughness relative to the plains as evidenced by their higher rms slope standard deviations. This variability within the flows might have implications concerning the genesis and deposition of the flow materials. For example, the pattern of roughness variations could provide information concerning the rheologic state(s) of the flow materials during transport. Asimow and Wood **[2]** point out that the viscosity and yield strength of lava-like flows (melt rock, acoustically fluidized materials **[8]**) increase with distance from the source (e.g., the distal pahoehoe to aa transition observed for terrestrial lavas **[9]**), while debris-like flows (pyroclastic flows, debris avalanches) can exhibit the opposite behavior due to sorting of flow components. Detailed analysis of radar property variations within individual FEB flows might provide a means to constrain the type of flow regime and/or rheology that was dominant during emplacement of a flow unit.

Future work. Altimetry and radiometry from subsequent Cycles of the Magellan mission will provide a more comprehensive analysis of FEB materials, with emphasis on variability of radar properties downflow and correlations between different properties. Software is currently being developed to automate the synthesis of the radar property data sets using ARCDR data. This will permit quicker and more accurate analysis of the radar properties of all FEB craters. Comparison of backscatter data at two or more look angles to different scattering functions will also be done to assist in FEB classifications.

Table 1. FEB Flows: Preliminary average values from Cycle 1 altimetry and radiometry.

Crater	Corr. ρ	(Error)	Slope °	(Error)	Fit	σ (dB)	Emissiv.	N(alt)	N(rad)
Addams	.17 ± .05	.02 ± .02	3.4 ± 1.4	0.3 ± 0.2	.58 ± .22	3.2 ± 0.9	.879 ± .007	203	302
Isabella	.11 ± .02	.01 ± .00	2.5 ± 1.0	0.2 ± 0.1	.53 ± .27	2.0 ± 1.7	.864 ± .011	580	692
Seymore	.08 ± .01	.01 ± .01	3.3 ± 0.7	0.3 ± 0.2	.75 ± .19	0.0 ± 1.6	.855 ± .011	188	381
4S-155.5	.08 ± .02	.01 ± .01	4.1 ± 2.1	0.5 ± 0.8	.68 ± .21	4.2 ± 1.3	.908 ± .017	307	612

Table 2. Plains: Preliminary average values from Cycle 1 altimetry and radiometry.

Crater	Corr. ρ	(Error)	Slope °	(Error)	Fit	σ (dB)	Emissiv.	N(alt)	N(rad)
Addams	.20 ± .05	.02 ± .02	2.6 ± 0.9	0.2 ± 0.1	.55 ± .20	0.8 ± 0.7	.869 ± .007	517	947
Isabella	.14 ± .03	.01 ± .00	1.4 ± 0.1	0.1 ± 0.0	.47 ± .23	-0.8±1.4	.862 ± .148	2112	2331
Seymore	.09 ± .02	.01 ± .00	2.4 ± 0.7	0.2 ± 0.1	.66 ± .23	-1.7±1.0	.836 ± .010	653	1534
4S-155.5	.11 ± .02	.01 ± .00	2.0 ± 0.7	0.2 ± 0.1	.61 ± .23	0.1 ± 1.2	.873 ± .023	527	950

*Note: Addams is a provisional name, while 4S-155.5 was formerly named Franklin **[1]**. ± values are standard deviations about the mean. **Corr.** ρ is the corrected reflectivity. **Slope** is the rms meter-scale slope of the surface (expressed in degrees). **Error** is formal error from ARCDR data (ar_error parameter). **Fit** represents non-range-sharpened goodness-of-fit between the observed echo profile and the MIT-derived Hagfors' function template (ar_fit parameter in ARCDRs). σ is the average SAR backscatter value (expressed in decibels) obtained from the ARCDRs (rr_sar parameters) **[5]**. **Emiss.** is the emissivity obtained from the radiometer data on the ARCDRs. **N(alt)** and **N(rad)** are the number of altimeter and radiometer footprints, respectively, that were used in the analyses (altimeter footprints provide the corrected reflectivity and rms slopes, while the radiometer footprints provide the emissivity and running-average backscatter **[5]**).

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