Characterization of Ejecta Facies around Large Venusian Craters: Implications for the Origin of Flow-like Ejecta M. S. Edmunds and V. L. Sharpton, Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston, TX 77058, also Dept. of Geosciences, University of Houston, Houston, TX 77004.

Large impact craters on Venus as revealed by the Magellan spacecraft are surrounded by several distinct ejecta facies. These include the inner continuous hummocky ejecta, dark margins, dark and light paraboloid streaks, and an outer ejecta facies that has a flow-like morphology [2]. Several of these facies appear to be unique to Venus. The outer ejecta unit appears to have been emplaced as an extremely low viscosity fluid based on the large distances it traveled. Several origins for this unit have been proposed including impact induced volcanism, impact melt, and atmosphere-ejecta interaction [2,5]. We are in the process of characterizing the ejecta facies for all of the large craters that show well preserved evidence for this flow-like unit in order to better understand its origin and temporal and spatial position during crater excavation and ejecta emplacement.

Preliminary observations of many of these craters show evidence for flow origins in the upper flanks of their continuous ejecta between flaps of continuous ejecta (Fig. 1). Several of the flows appear to originate in breaks in the crater rim (e.g. southern rim of Cochran). Few tributaries are observed in the continuous ejecta. The craters Yblochkna (Fig. 1a) and Stuart (Fig. 1b) show particularly well developed flows of this type. The northwest portion of Stuart's ejecta (not shown) also shows morphologic evidence for two types of flow-like units. The first is similar to the highlighted flow in Fig. 1b, in that it has very lobate margins and a sharp boundary with the surrounding plains. The other, best developed to the west-northwest, has a finger-like morphology and a diffuse boundary with the surrounding plains. This unit appears to originate over a broad area and may correspond to the flows of turbulent ejecta-atmosphere interaction proposed in [3]. The flow-like unit at Yblochkna is areally less extensive and is dominated by the lobate unit, but small areas of the diffuse type are observed.

Many other craters show flows that are fed from small-to-moderate sized smooth (radar dark) areas (e.g. Callirhoe) on the upper flanks of the continuous ejecta. Large dark floor channels occur with units of this type. Phillips et al. (1991) interpreted these smooth areas to be impact melt. Production of such melt should be enhanced on Venus due to its higher gravity: up to five times the lunar amount has been suggested [2]. Entrainment of such voluminous quantities of melt could contribute significantly to the production of flow-like units.

The observation that many of these flows have their origins at the crater rim or in small areas in the upper ejecta would seem to argue against their origin in a turbulent ejecta-atmosphere interaction as proposed in [3]. This mechanism seems to require a broad region for interaction between the expanding ejecta curtain and the atmosphere. The continuous ejecta also appear to have been in place prior to their being scoured and channelized by the emplacement of the flow-like unit: emplacement of the flow-like units was a late time process.

Based on these observations we propose a model in which impact melt lining the crater's transient cavity is forced out during the modification stage of crater formation by rebound of the floor. This mechanism would be particularly effective in evacuating impact melt from the interior of large craters. Impact melt that spills out of the crater during the modification stage of crater formation forms many of the flows, with some material flowing downslope and directly forming flows, while others pool proximal to the crater rim before flowing down the crater's flanks (e.g. Callirhoe).

It seems reasonable however, that all the flow-like units may not have a single origin, and both impact melt and a dense ground-hugging flow not unlike a terrestrial pyroclastic flow [3], contribute. We are continuing our investigation with this in mind, and plan to use other Magellan data products in addition to SAR to better characterize these units. Determining the relative contributions of both will be non-trivial.
Venusian Crater Ejecta Facies, Edmunds and Sharpton