AN OUTFLOW CHANNEL IN LADA TERRA, VENUS. T. Parker, University of Southern California, Los Angeles; G. Komatsu, V. Baker, and V. Gulick, University of Arizona, Tucson; R. Saunders, C. Weitz, Jet Propulsion Laboratory, California Institute of Technology, Pasadena; and J. Head, Brown University, Providence, Rhode Island.

The Magellan SAR images have revealed that channels - which exhibit traits of lunar volcanic rilles and terrestrial and martian fluvial systems (1) - may be relatively common landforms on Venus. In (1, 2, 3), we describe the overall geomorphology and geologic associations, and propose physical properties of the melts that carved these channels. Here, we describe the largest of these systems observed to date. The channel we focus on lies within the northern Lada Terra region, centered near 50°S lat., 21° lon., about 15° east of Lavinia Planitia. The Pioneer Venus Orbiter topographic map exemplifies the only coverage obtained of this region prior to the Magellan mission, as the Earth-based radar coverage does not extend this far east at this latitude.

The Magellan SAR and Altimetry data reveal the channel to lie on the south flank of a broad, low volcanic construct (part of a large corona-like feature) at about 47°S lat., 19° lon. The center of this construct lies at 500-800m elevation above the planetary mean radius of 6051.9km (0km datum). Its flanks have gentle slopes, typically less than 8m/km. Southwest of this construct and the channel is a north-northwest trending rift valley, which appears to be splitting the corona-like feature apart. This valley is up to 50km or more wide, up to 800m deep, and locally exhibits raised rims on either side. The eastern rim is elevated about 200m above the channel, deflecting its path to the east (preventing it flowing into the lower rift valley floor). The floor of the rift lies at an elevation of about -400m elevation. To the east the channel encounters a long north-south trending ridge belt at 27° longitude - possibly defining the rim of a large corona. This ridge belt locally ranges up to about 200-300m high. At 47°S lat., 27° lon., this belt is breached or buried by lava flows from the west and by flows from the channel.

The channel originates in a collapse structure 17.5km wide and 31.3km long, that is morphologically similar to collapsed terrains at the sources of many modest-scale martian outflow channels (e.g., 4,5). This collapse structure lies on the southwest flank of one of the peaks of the volcanic construct described above. Magellan altimetry indicates slopes of about 2m/km at the channel source. From this collapse structure, the channel flows into a trough or graben 300km long and up to 5.5km wide. This trough trends north-northwest, subparallel to the rift. It appears to have been enlarged through collapse, particularly at its north end where it is linked to the collapse terrain source, and may have served as both an additional source and an initial conduit for the flow. Flow structures within the trough, if present, are at a scale below the resolution limit of the data (about 220m at this latitude).

East of this trough, a narrow channel 300km long and up to 1km wide apparently contained a small part of the initial flood. This channel is a shallow, radar-dark sinuous feature with radar-bright margins and occasional mid-stream islands. It terminates before joining the main channel, and was probably buried or modified by subsequent flow from the main channel. The slope through both the trough and this narrow channel is about 0.5m/km.

At 51.5°S lat., 20.5° lon., the flood spreads into a spectacular, anastomosing reach (fig. 1), flowing east to 51.5°S lat., 24° lon. It begins near the end of the trough, apparently as a result of spillover of the trough rim. Numerous, well developed midstream islands suggest effective thermal and mechanical erosion of the extant plains surface. Several faint channels to either side of the main system and the burial of the narrow channel suggest initial sheet flooding prior to development of the main system. At 51°S lat., 23.5° lon., local topographic highs appear to have temporarily obstructed the flood, which then embayed the highlands until the obstructions were overtopped. The best developed streamlined structures within the main channel probably developed as the ponded flood material drained through these gaps. The slope through this reach is less than 0.5m/km and may even be uphill toward the end. The topography this far east may be uncertain, due to possible unresolved navigation corrections in the altimetry data at the time of this writing. The total length of the anastomosing reach is about 250km.

East of the breach in the highlands, the flood immediately begins to spread out into radar-bright irregularly lobate flows. The channel branches into three distributary channels that initially are radar-dark but change to radar-bright channels with dark lateral margins about midway through the reach. This "distributary reach" continues east until it encounters the ridge belt at 51.5°S lat., 26.5° lon. The total length of this reach is about 130km. Individual channels range in width from 2km to 6km.

The flood terminates in a partially confined, radar-bright plains deposit on the west side of the ridge from 47°S to 51.5°S lat., 26° to 27° lon., apparently filling a 60km wide trough between the ridge belt and the flank of the volcanic construct to the west. The "main" channel branch can be traced through this deposit to just beyond the breach in the ridge belt at 47°S lat., 27° lon., more than 300km north of the "end" of the distributary reach.

The final deposit is also a radar-bright plain exhibiting well-defined irregularly lobate margins typical of lava flows. It occupies a region of about 100,000 km^2, extending from 46°S to 53°S lat., 27° to about 32° lon. Though most of the deposit is radar-bright, it is often bounded by a radar-dark (relative to extant terrain) margin or halo. South of 51°S lat., much of the deposit is radar-dark.

This channel exhibits many characteristics that, on Earth and Mars, we generally attribute to water erosion. However, its direct association with volcanic structures and deposits (not to mention the very high surface temperatures on Venus) tends to rule out water as the responsible fluid. In addition, this channel appears to be quite young relative to other channels we have observed thus far. Unlike many Venusian channels, it is cut by very few structural lineaments, though it lies within a region that seems to have been tectonically very active.

The simplest assumption to be made with regard to compositional inferences, then, is that the Venusian surface environment at the time the channel formed was not much different from today. Implied compositions might therefore include very high effusion temperature mafic lavas or other exotic melts (3).

REFERENCES: (1) Gulick, V. C. et al. (1991), LPSC XXII. (2) Komatsu, G. et al. (1991a), LPSC XXII. (3) Komatsu, G. et al. (1991b), LPSC XXII. (4) Baker, V. R. (1982), The Channels of Mars, Univ. Texas Press, (5) Mars Channel Working Group (1983), GSA Bull. 94, p. 1035-1054.

Figure 1: Anastomosing reach of outflow channel in Lada Terra (East is up). Note development of radar-bright lava flows at top where "Distributary reach" begins. Scene width (West to East) approximately 350km.