CHANNELS ON VENUS: AN OVERVIEW. V.R. Baker, G. Komatsu, V.C. Gulick, and J.S. Kargel, Lunar and Planetary Lab, University of Arizona, Tucson, AZ 85721; T.J. Parker, Dept. of Geological Sciences, University of Southern California, Los Angeles, CA 90089-0741

As with the unexpected discovery of channels on Mars [1], the numerous channels revealed by Magellan radar images of Venus inspire multiple hypotheses of genesis. While nearly every conceivable fluid has been proposed for Martian channels [2], the Venusian channels were probably eroded by fluids that maintain appropriate flow properties at surface temperatures near 730° K and pressures near 90 bars. The morphologies of various channels set limits on the compositions of the probable genetic fluids.

Through early January, 1991, we had catalogued more than 50 channel systems in a preliminary survey of Magellan radar mapping imagery. The channels types [3] include the following: (i) long, sinuous single-channel systems tens to hundreds of kilometers in length and 1 to 5 kilometers wide, (ii) anastomosing or braided channel complexes up to tens of kilometers in width and hundreds of kilometers long, and (iii) compound systems comprising elements of types (i) and (ii). Especially unusual is an integrated (iv) valley network complex (lat. 2° N, long. 70° E) consisting of a 50 kilometer trunk segment and at least 15 first-order tributaries.

The channels occur in a great variety of geological settings [4] including the following: (i) drainage from coronae and other volcanic complexes, (ii) erosion into extensive volcanic plains, (iii) dissection of complex mountain ranges of tectonic origin, including Frejya Montes and the tessera uplands of Lada Terra, and (iv) outflow from impact areas.

The latter include channels draining areas of fluidized ejecta blankets (FEBs) that surround certain Venusian impact craters. Like other compound channels, those draining FEBs display streamlined residual uplands in anastomosing complexes that indicate high fluidity for the channel-forming flows.

Perhaps the most remarkable Venusian channel complex studied to date originates at 20 x 30 km collapse structure at lat. 47.5° S, long. 19° E [5]. Flow continued into a 300-km long trough about 5 km wide, which may have also served as a fluid source. A spectacular anastomosing reach (lat. 51° S, long. 21° E) consists of multiple channels and streamlined residual uplands. The channel-forming flows were ponded by local topographic highs until they rose to spillover points [5]. The entire system terminates at a deltaic deposit complex (lat. 47° S, long 28° E). The distributary system, streamlined "islands", spillovers, abandoned channels, and bar-like forms all have a distinctive fluvial flood-like character [1]. Their origin requires immense discharges of a fluid that maintained liquid water-like mechanical properties for prolonged periods of time.

While some Venusian channels have morphologies and settings similar to terrestrial lava channels and lunar sinuous rilles, there seems a transition in forms to the fluvial-like compound systems described above. The unusual high fluidity required by the latter is parallel in its character to the high fluidity required for some FEBs. The latter seem best explained [6] either as (i) superheated impact melts of crustal silicate rocks, or as (ii) impact-released melts of special nonsilicate composition. Sulphur and carbonatite melts are possible candidates [6]. The melts responsible for fluvial-like channels on Venus seem to require special compositions [7]. These melts were emplaced not only at volcanic complexes and coronae, but also in tectonic uplands such as Frejya Montes. The latter probably comprises a chain of megaconcentric structure generated by mantle hot-spot activity [8]. The mantle sources may be important in generating the melt properties. Possible compositions capable of producing the fluidities required for the fluvial-like channel morphologies include (i) Fe-Ti: "lunar-type" basalt, (ii) komatiite, and (iii) sulphur. Of these, (i) is most marginal, though it was advocated even for the origin of Martian outflow channels [9]. Komatiite, which may generate turbulent flows [10] and is associated with channel erosion in terrestrial Archaean terranes [11], may be the most likely candidate because of its probable abundance. The possible parallels to Archaean Earth are especially interesting.

While an aqueous genesis of the Venusian channels seems very unlikely on the theoretical grounds, observational criteria are not sufficient to absolutely falsify its hypothetical possibility.

References. [1] Baker, V.R. (1982), *The Channels of Mars*, Univ. Texas Press. [2] Baker, V.R. (1985) in *Models in Geomorphology* (ed. M. Woldenberg), Allen and Unwin, 287–312. [3] Gulick, V.C., Komatsu, G., Baker, V.R., Strom, R.G., and Parker, T.J. (1991), Channels on Venus: A Preliminary Morphological Assessment and Classification, *LPSC* **XXII** (this volume). [4] Komatsu, G., Gulick, V.C., Baker, V.R., and Parker, T.J. (1991), Locations and Geological Settings of the Venusian Channels, *LPSC* **XXII**, (this volume). [5] Parker, T., Komatsu, G., Baker, V., Gulick, V., Saunders, R., Weitz, C., and Head, J. (1991), An Outflow Channel in Lada Terra, Venus, *LPSC* **XXII**, (this volume). [6] Komatsu, G., Kargel, J.S., Baker, V.R., Lewis, J.S., and Strom, R.G. (1991), Fluidized Impact Ejecta and Associated Impact Melt Channels on Venus, *LPSC* **XXII**, (this volume). [7] Kargel, J.S., Komatsu, G., Lewis, J.S., and Baker, V.R. (1991), Compositional Constraints on Outflow Channel-Forming Lavas on Venus, *LPSC* **XXII**, (this volume). [8] Finn, V.J., Baker, V.r., and Komatsu, G. (1991), Morphostructural Analysis of Ishtar Terra, Venus, *LPSC* **XXII**, (this volume). [9] Schonfeld, E. (1977), *LPSC* **VIII**, 843–845. [10] Huppert, H.E., Sparks, R.S.J., Turner, J.S., and Arntdt, N.T. (1984), *Nature* **309**, 19–22. [11] Lesher, C.M. (1991) in *Reviews in Economic Geology*, (eds. A.J. Naldrett, P. Candella, A.H. Clark, C.M. Lesher, E. Mathez, and J. Whitney), vol. **4**, in press.