LARGE SCALE EROSIVE FLOWS ASSOCIATED WITH CHRYSE PLANITIA, MARS: SOURCE AND SINK RELATIONSHIPS. K.R. Blasius, J.A. Cutts and Wm. J. Roberts, Planetary Science Institute, 283 S. Lake Ave., Suite 218, Pasadena, CA 91101

Enormous channels 1000 to 2000 km long and with a total area of about $10^6 km^2$ connect patches of chaotic terrain totaling about $5 \times 10^5 km^2$ (1) to low lying Chryse Planitia. The occurrence along these channels of evidence of fluid erosion, primarily anastomatic reaches, streamlined bedforms and islands, and the topographically depressed character of chaotic terrain led previous investigators (2,3,4,5) to hypothesize catastrophic release of liquid water from the areas of chaos as they subsided. A reassessment of this hypothesis here is based upon stratigraphic and topographic relationships seen in Viking Orbiter images:

a. Fluid erosional forms of substantial relief occur on central and northern Chryse Planitia, far beyond the presumed sink for flood debris.

b. The channels or zones of fluid erosion generally broaden downslope, contrary to their appearance in poorer quality pre-Viking images.

c. Where channel heads join chaotic terrain the streamlined erosional forms are truncated abruptly, often along a scarp facing the chaos interior. No drainage networks are seen within the chaos.

Fluid erosion by large scale flows extends greater distances (1500 to 2500 km) and eroded far greater areas ($\gtrsim 2 \times 10^6 km^2$) than previously inferred. The total estimated volume deficiency in chaotic terrain ($\sim 10^5 km^3$) and the estimated volume of downstream erosion ($\gtrsim 2 \times 10^5 km^3$) by terrestrial standards are inconsistent with the catastrophic one-time release of water from chaos.

Zones eroded by large scale flows broaden downslope as if the mechanism of incision gathered power. In the hostile (cold and low pressure) environment of Mars surface evaporation, freezing, and absorption into the regolith would be expected to diminish the erosive power of flood waters away from their source. Apparently, the fluid involved or an erosive bedload were incremented significantly downstream from the chaotic terrain.

Chaotic terrain development appears to have been prolonged beyond the period of channel incision to enlarge the area of chaos at the expense of both the surrounding ancient cratered terrain and the channels. Thus, patches of chaos cannot be considered to preserve within them the original morphology of channel source regions. Additionally, the present areal extent of chaos connected to large scale flow channels is an overestimate of the possible source area for catastrophic water outflow; the discrepency cited above between estimated erosion and water outflow is thus enhanced.

The features formed by large scale channelized flows onto Chryse Planitia are better explained by repeated atmospheric flows than by one-time emptying of several water reservoirs. The chaotic terrain is envisioned to have been the source of an erosive saltating bedload for the flow rather than the source of fluid. The apparent increase in erosion downstream may be the consequence of the building up of both suspended load and bedload in the flow.

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During the search for a landing site for Viking 1 much of Chryse Planitia was photographed at high resolution (40 to 50 m per picture element) in a vain attempt to locate the sediment dumped by the hypothetical great floods. The evidence of a considerably larger eroded zone found recently, indicating erosive flow out of Chryse Planitia to the north, and the proposal here that the flows were atmospheric in origin allows one to conceive of spreading more widely the debris scoured from channels. The suspended load may have been spread around the planet over the vast northern plains (Vastitas Borealis) while the saltating bedload probably accumulated more locally, perhaps forming the plains and mesa units observed in patches in eastern Acidalia Planitia at the proposed Cydonia landing site for Viking 2 (6).

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