Quantitative Geomorphology of the Mars Eberswalde Delta

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ABSTRACT

The Eberswalde delta (Edgett, 2005) is composed of six separate depositional lobes that have prograded some 17 km from their apex. Cross-cutting distributary relationships and compensated depositional lobes are clearly visible in images acquired by the Mars Global Surveyor Mars Orbiter Camera. Sinuosity, radius of channel curvature, meander-bend width, and channel width parameters are examined for several lobe systems. Channel sinuosities of between 1.2 and 1.8 define low- to moderate-sinuosity systems typical of the type transporting bed or mixed-grain-size loads. Channel systems increase in sinuosity as they get older. However, some of the younger systems show specific reaches of increased sinuosity. These localized changes may be due to either abutment against resistant beds of older lobes or rise in base level at the channel system terminus. If the former, such effect of older deposits on the morphology of the channels suggests that these older lobes were fairly well indurated prior to the deposition of the youngest progradational lobes. Eighty-six percent of distributaries in the Mars Eberswalde delta are 100 to 240 m wide. Comparatively, 62% and 44% of distributaries in the Atchafalaya and Wax Lake Deltas of Louisiana, respectively, are of similar size. Small distributaries may indicate lower average and shorter duration flows or coarser sediment in Mars distributaries than those typical of the Gulf Coast systems. The volume of the material in the Mars deposit suggests long periods of sediment deposition. Sinuosity indexes, meander-bend migration, and ridge-and-swale point-bar topography suggest periods of stable discharge on the delta surface.