STREAMLINED EROSIONAL FORMS OF KASEI AND MAJA VALLES, MARS. Victor R. Baker and R. Craig Kochel, Department of Geological Sciences, The University of Texas at Austin, Austin, Texas 78712.

We have now completed measurements on 95 streamlined uplands or "teardrop-shaped islands" in two major Martian outflow channels, Kasei and Maja. The data were obtained by techniques previously described by Baker and Kochel (1, 2). They are compared to measurements on 137 streamlined hills and bars in the Channeled Scabland of eastern Washington (3). The three physical parameters that proved easiest to measure from Viking orbital photographs were length L (km), measured parallel to the inferred flow direction; width W (km), measured as the maximum width of the streamlined form perpendicular to the inferred flow direction; and area A (km^2), measured with a polar planimeter. We only measured the best developed streamlined shapes, ie. shapes for which fluid dynamic considerations dictate minimum flow separation in the responsible erosive fluid.

Figures 1, 2, and 3 show that all the data conform in a general manner to the following simple model:

$$L = 2\sqrt{A} \qquad (1)$$

$$W = 2/3\sqrt{A} \qquad (2)$$

$$L = 3W \qquad (3)$$

There is, however, a tendency for the Martian forms, especially in Maja Vallis, to be slightly more elongate than their scabland counterparts (L=4W). This is confirmed statistically by the "best-fit" regressions summarized in Table 1.

Considerations of pressure drag and skin resistance, discussed by Baker and Kochel (2), explain the more elongate Maja forms in terms of the lower frictional drag coefficients that prevail at higher Reynold's numbers. As the L/W ratio increases, pressure drag is reduced until it becomes equal to the total skin resistance. For highly turbulent flows (Reynold's numbers $> 3 \times 10^6$), this equilibrium shape developes at higher L/W values as a function of the Reynold's number. If the more elongate Martian forms developed in water flows, as did the scabland forms, then the Reynold's numbers for those flows probably exceeded scabland values by a factor of about 0.5, based on the crude relationship presented by Baker (4). Other factors being equal, the Martian forms probably developed at slightly higher flow velocities and/or greater flow depths than the scabland forms, a result that is consistent with the greater scale of channel erosion on Mars than in the Channeled Scabland (5).

References: (1) Baker V. R. and Kochel R. C. (1978) N.A.S.A. Tech. Memo 79729, p. 251-253. (2) BakerV.R. and Kochel R.C. (1978) Proc. Lunar Planet. Sci. Conf. 9th, p. C403-C413. (3) Baker V. R. (1978) in The Channeled Scabland, p. 81-115. N.A.S.A. Planetary Geol. Program, Washington. (4) Baker V. R. (1978) N.A.S.A. Tech. Memo 79729, p. 248 250. (5) Baker V.R. and Milton D.J. (1974) Icarus 23, p. 27-41.

STREAMLINED FORMS

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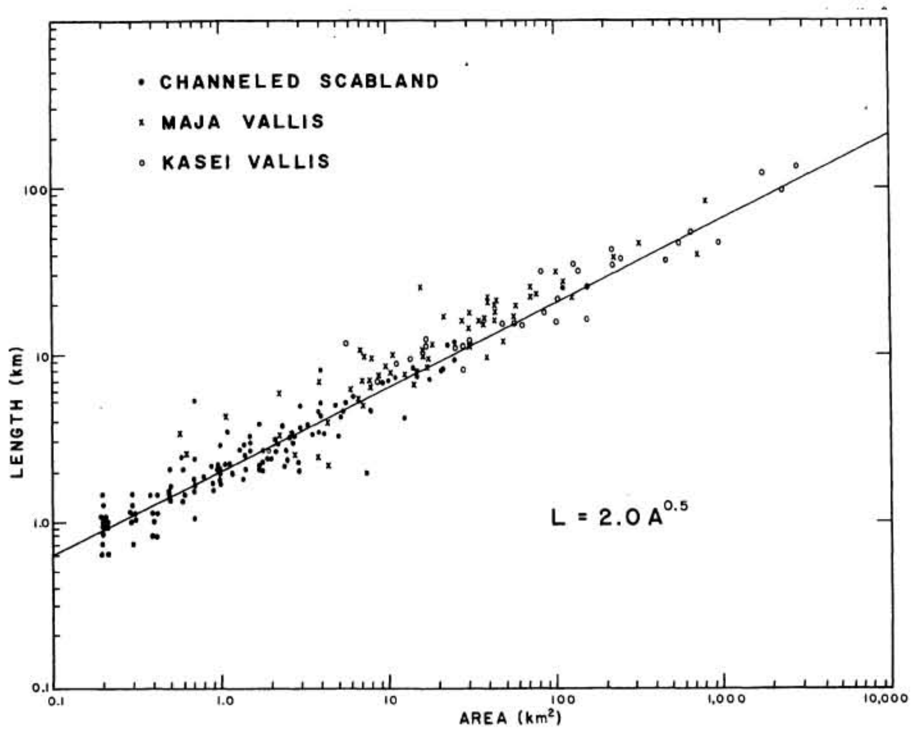

Figure 1. Length of streamlined forms versus planimetric form area for the Channeled Scabland, Kasei Vallis, and Maja Vallis. The plotted equation is a general model, not a regression line.

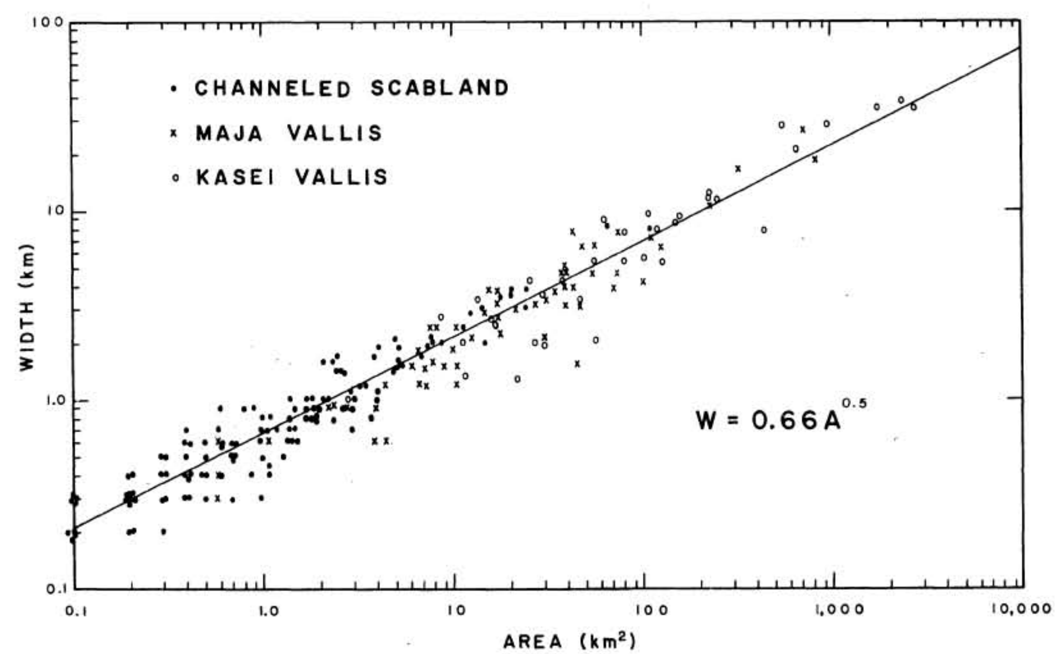

Figure 2. Maximum width versus planimetric form area for the same streamlined forms analyzed in Figure 1. The plotted equation is a general model.

STREAMLINED FORMS

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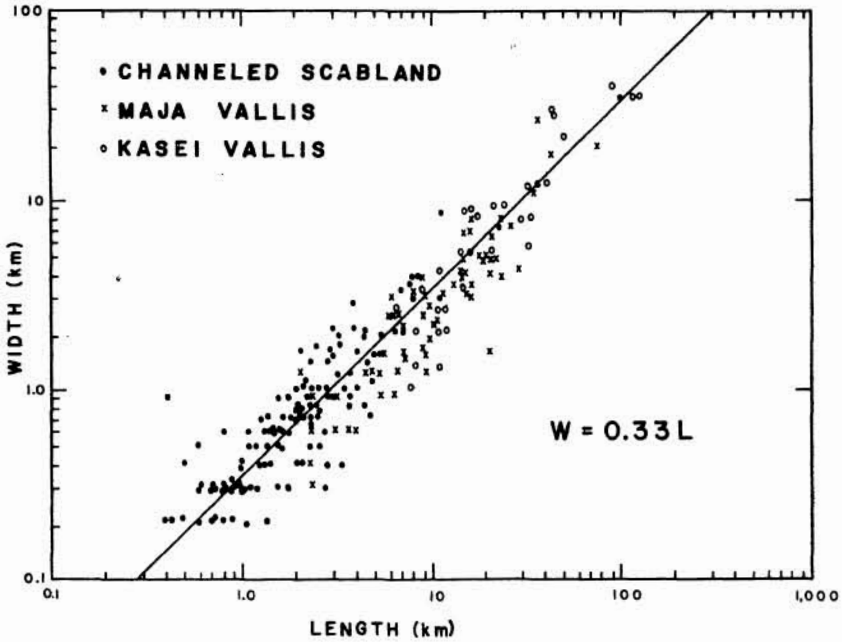

Figure 3. Maximum width versus length for the same streamlined forms analyzed in Figures 1 and 2. The plotted equation is a general model, not a regression line.

Table 1. Regression equations for shapes of streamlined forms on earth and Mars. The term "r" is the product-moment correlation coefficient for the least-squares regressions.

SCABLAND LOESS HILLS AND BARS	MAJA AND KASEI VALLES
$N = 137$	$N = 95$
$L = 1.93A^{0.479}$	$L = 2.96A^{0.438}$
$r = 0.94$	$r = 0.91$
$W = 0.66A^{0.496}$	$W = 0.50A^{0.56}$
$r = 0.92$	$r = 0.95$
$W = 0.34L^{0.98}$	$W = 0.23L^{1.05}$
$r = 0.87$	$r = 0.85$