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The sinuous ridge and channel network within Rahway Vallis and the wider contextual study of the surrounding Rahway Basin, Mars.

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Rahway Vallis is a previously identified shallow v-shaped valley network in the Mars Orbiter Laser Altimeter data, located at 10°N 175°E, within the Cerberus Plains in the Elysium Planitia region of Mars. Rahway Vallis is situated in low-lying terrain bounded to west, north and east by older highlands, and to the south by the flood-carved channel system Marte Vallis. Here we present a study of the low-lying area in which Rahway Vallis sits, which we refer to as the "Rahway basin". The floor of the Rahway basin is extremely flat (sloping at 0.02° south-east) and hosts a branching network of ridge and channel systems. The aim of this project is to determine the genesis of these branching forms, in particular to test the hypothesis that they are glaciofluvial in origin.

Using topographic cross-profiles of the channels that are identifiable in CTX 6 m/pixel images, we have found that they are set within broader v-shaped valley that has almost no morphological expression. These valleys have a convex-up, shallow (around 15 metres vertically compared to several kilometres in the horizontal) V-shaped profiles that are consistent in form across the whole Rahway Basin. Long profiles show the channels to deepen with respect to the bank height downslope. Both channels and valley show a consistent downhill gradient from west to east. The channels typically widen down-slope and increase in width at confluences. If these are water-cut channels, they reach Strahler stream orders of 4, consistent with a contributory network with multiple sources.

Associated with the channels are sinuous ridges, typically several kilometres long, 20 m across, with heights on the order of 10 m. They sometimes form branching networks leading into the channels but also form individually and parallel to the channels. Possible explanations for the sinuous ridges include inverted fluvial channels and eskers. However despite looking through ca. 250 CTX images across the Rahway basin, no other glacial landform was identified. This makes the esker hypothesis unlikely.

We have found that the transition between the older heavily cratered highland terrain and the floor of the Rahway basin is often bounded by near-horizontal topographic terraces. These terraces appear continuous around the basin margin and are present in almost all locations where 6m/pixel resolution CTX images are available. These steps are at altitudes between -3108 m and -2620 m with a mean of -3000 m above the Mars datum and have a standard deviation of 68.7 metres. These properties suggest that the terraces could represent the palaeo-shorelines of a drained/evaporated standing body of water. A since drained standing body of water is consistent with the hypothesis that the channels and ridges are fluvial and inverted fluvial channels respectively.