Morphometric Characterisation of Eskers Associated with an Extant Mid-Latitude Glacier on Mars

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Evidence for basal melting of modern putative debris-covered glaciers (DCGs) on Mars is extremely rare.

- Modern DCGs are likely frozen to their beds, but has this always been the case? [4]
- Gallagher and Balme [1] identified sinuous ridges in the foreland of a late-Amazonian-aged (~150 Ma) DCG in Phlegra Montes (Figs 1-3).
- They interpreted these ridges as young eskers [Fig 4] – the first of their kind identified in association with a modern DCG on Mars.

**Eskers are diagnostic of glacial melting.**

- Eskers are ridges of sediment deposited by meltwater in ice-walled, typically subglacial drainage conduits, and subsequently exposed by glacier retreat [Fig 4].
- Their morphometry is strongly controlled by the geometry of their parent meltwater conduits which, in turn, is controlled by hydraulic conditions within them [e.g. 2].

We characterise candidate esker morphology with new high-resolution 3D data

**Plan-view geometry**

### Table 1: Segment and system sinuosity statistics for Phlegra Montes candidate eskers (PM), Dorsa Argentea (DA) [4], and Canadian eskers, Earth (CA) [5].

<table>
<thead>
<tr>
<th>Segments</th>
<th>Systems</th>
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<tbody>
<tr>
<td></td>
<td>PM</td>
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<tr>
<td>Min</td>
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<td>Max</td>
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</table>

**Cross-sectional morphology**


**Ongoing work**

**Phlegra Montes candidate esker morphometry**

- Tests for esker-like response of ridge height to longitudinal bed slope.

**NEW DCG-linked candidate esker in a similar graben setting**

- Abstract #1234, this conference.
- Supports the hypothesis that elevated geothermal heat was a pre-requisite for recent basal melting of mid-latitude glaciers on Mars [1].

**Modelling environmental conditions required for basal melting in Phlegra Montes**

- Exploring atmospheric temperature and geothermal heat scenarios using the JPL/University of California Ice Sheet System Model (ISSM) [8].

**References:**


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