Earth-like aqueous debris-flow activity on Mars at high orbital obliquity in the last Ma

Debris flows occurred at Earth-like frequencies during high-obliquity periods in Istok crater in Aonia Terra. Millimeters to centimeters of liquid water averaged over the catchments were required for the formation of debris flows. We quantify debris-flow size, frequency and associated liquid water contents on Mars, in the very young Istok crater in Aonia Terra.

**Introduction**

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**Study site: Istok crater**

Debris-flow volumes and return period

- Modal debris-flow volume is 605 m$^3$.
- Debris-flow return periods roughly range between 1 to 200 yr in the entire crater and per catchment, depending on the chosen obliquity threshold somewhere between 30° - 35°.

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**Methods**

- We aim to determine how much water melted during high-obliquity periods and how frequently this happened.
- We quantify debris-flow size, frequency and associated liquid water contents on Mars, in the very young Istok crater in Aonia Terra.

**Results**

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**Discussion**

- Millimeter- to centimeters of liquid water averaged over the catchments are required for the formation of the observed debris flows (Table 1).

**Conclusions**

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