

Recent debris flows on planet Mars

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Research group
River and delta morphodynamics



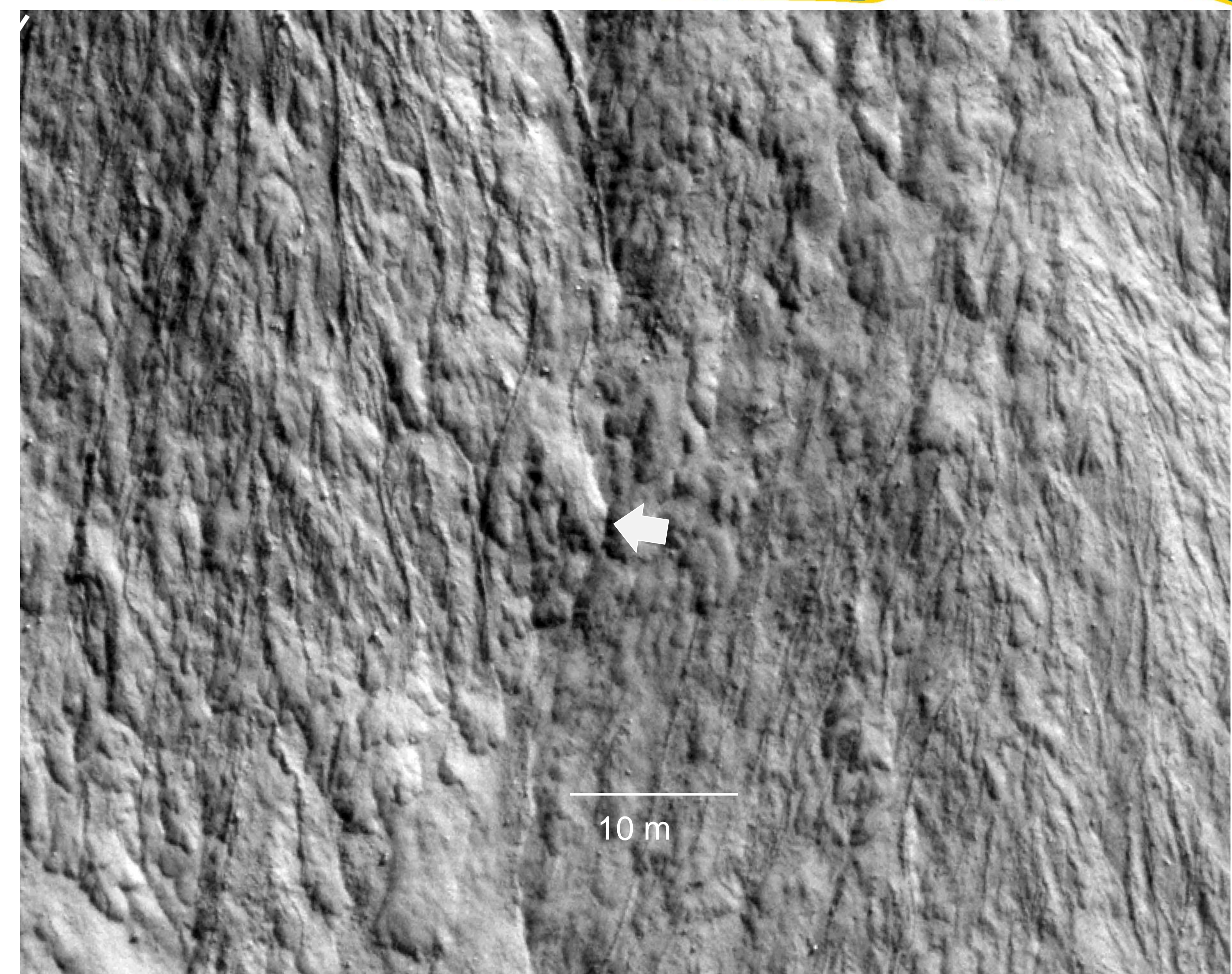
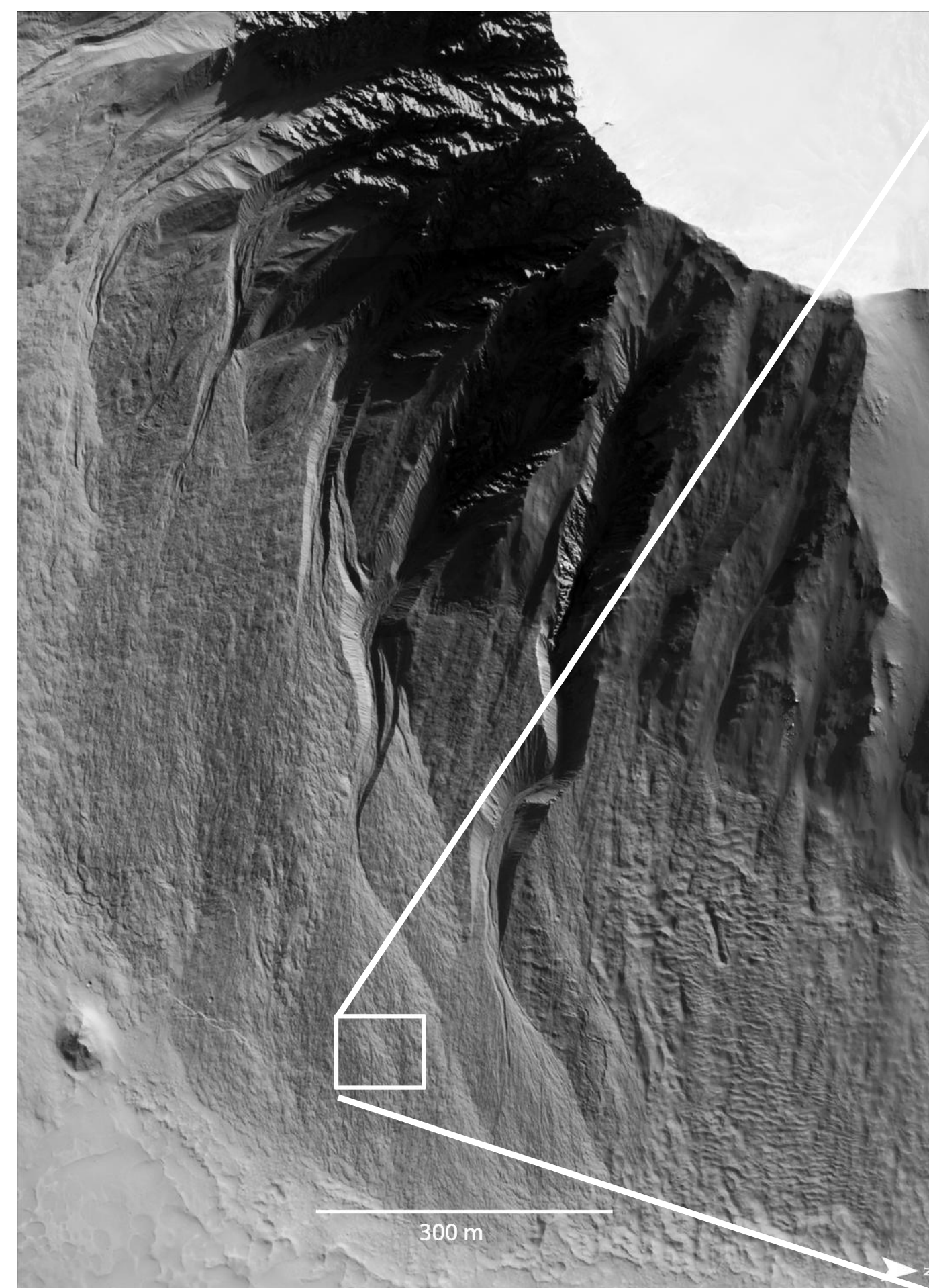
Ivar Lokhorst

Background:

- Debris flow like deposits found on Mars
- Little research done due to low recurrence interval and scaling issues
- Strong relation between boundary conditions and final morphology?

Challenge:

1. Investigate influence of:
 - clay
 - chute slope
 - coarse material
 - water
2. Compare Mars and laboratory deposits
3. Use it as indicator of subsurface and climatic conditions



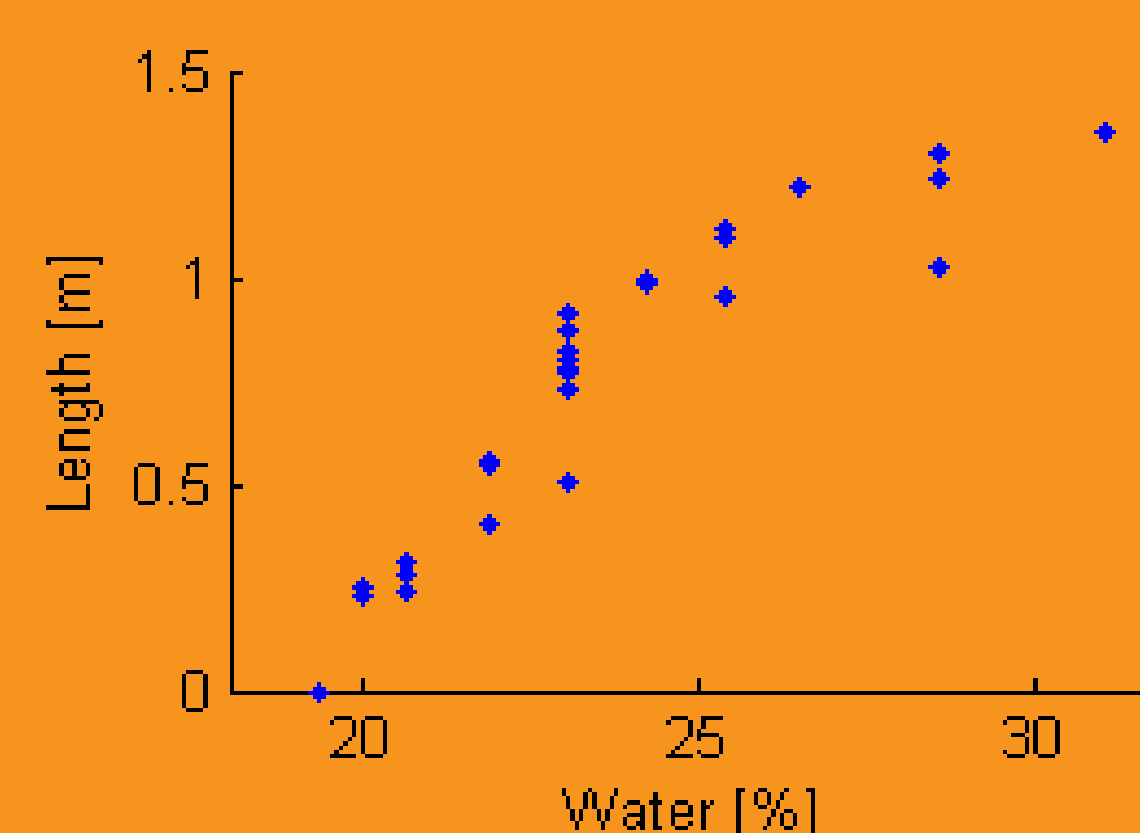
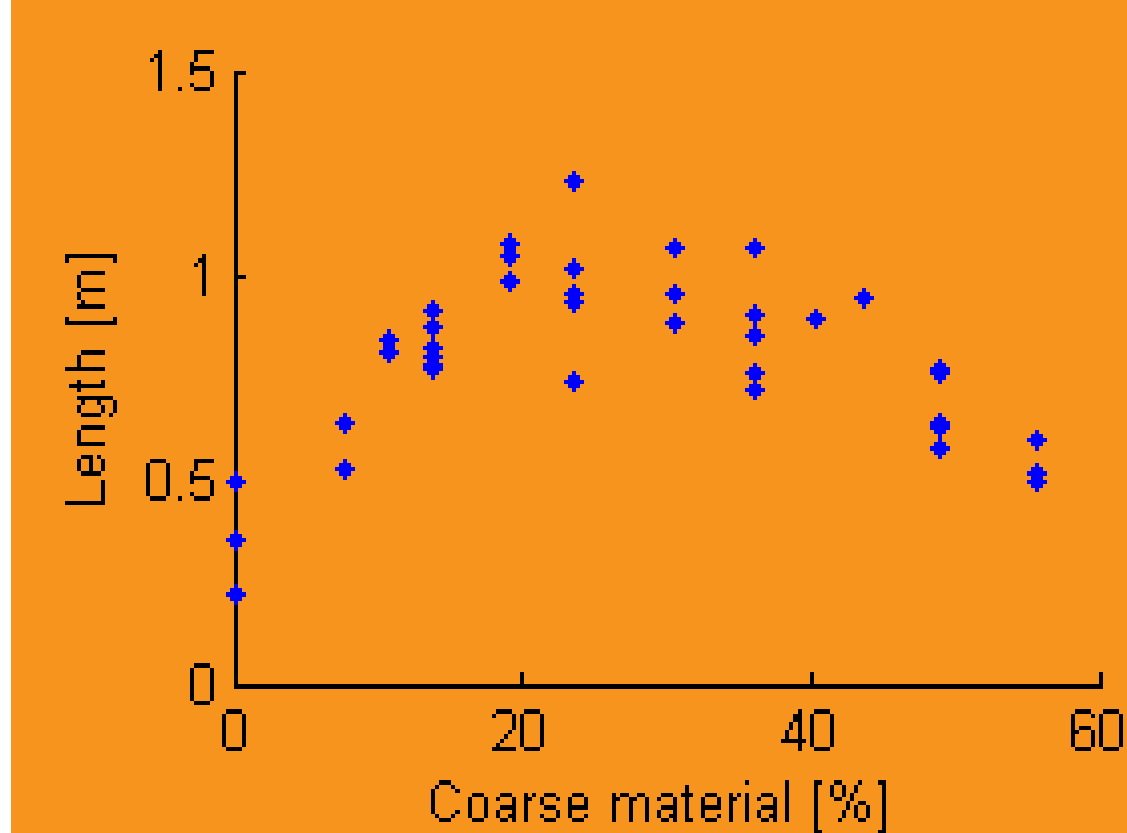
Debris flows on Mars

Research set-up:

- Mixing barrel to create homogeneously mixed flows (2)
- Chute
- Adjustable slopes of the drainage pipe and outflow plain to test their influence
- Sand bed on outflow plain to represent natural surface and flow resistance

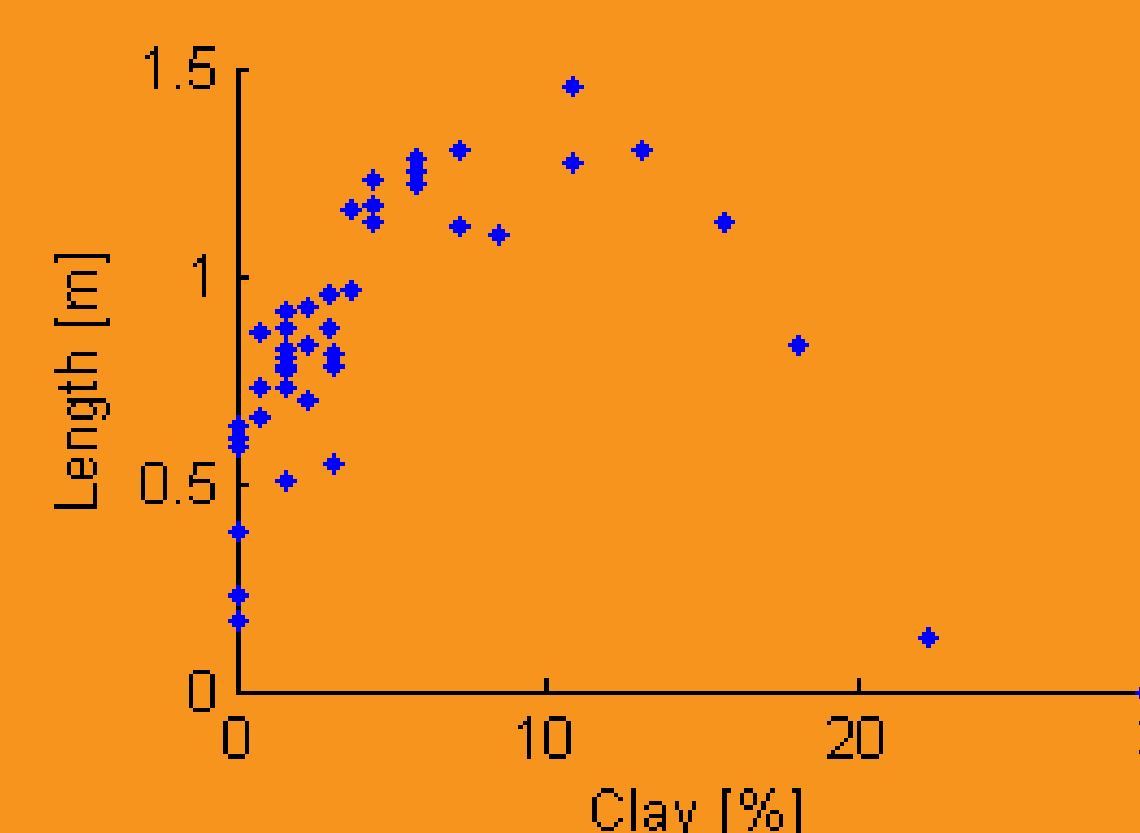
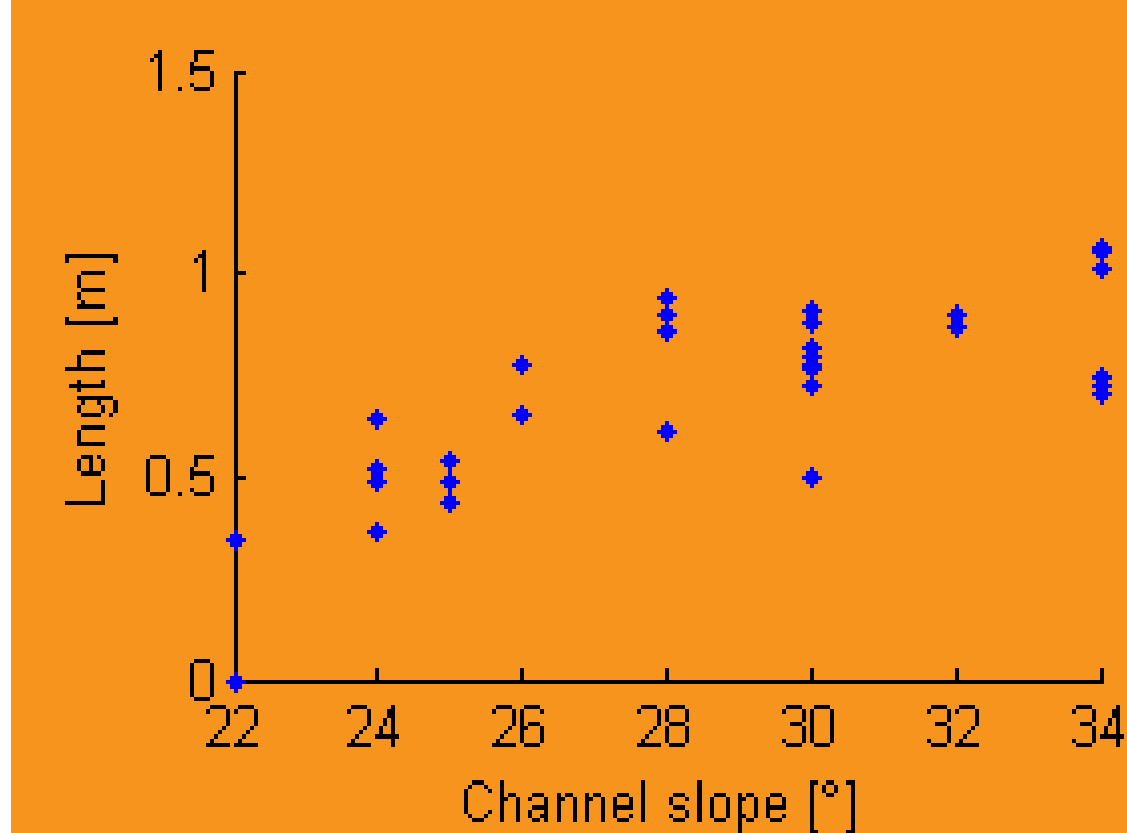


Results:

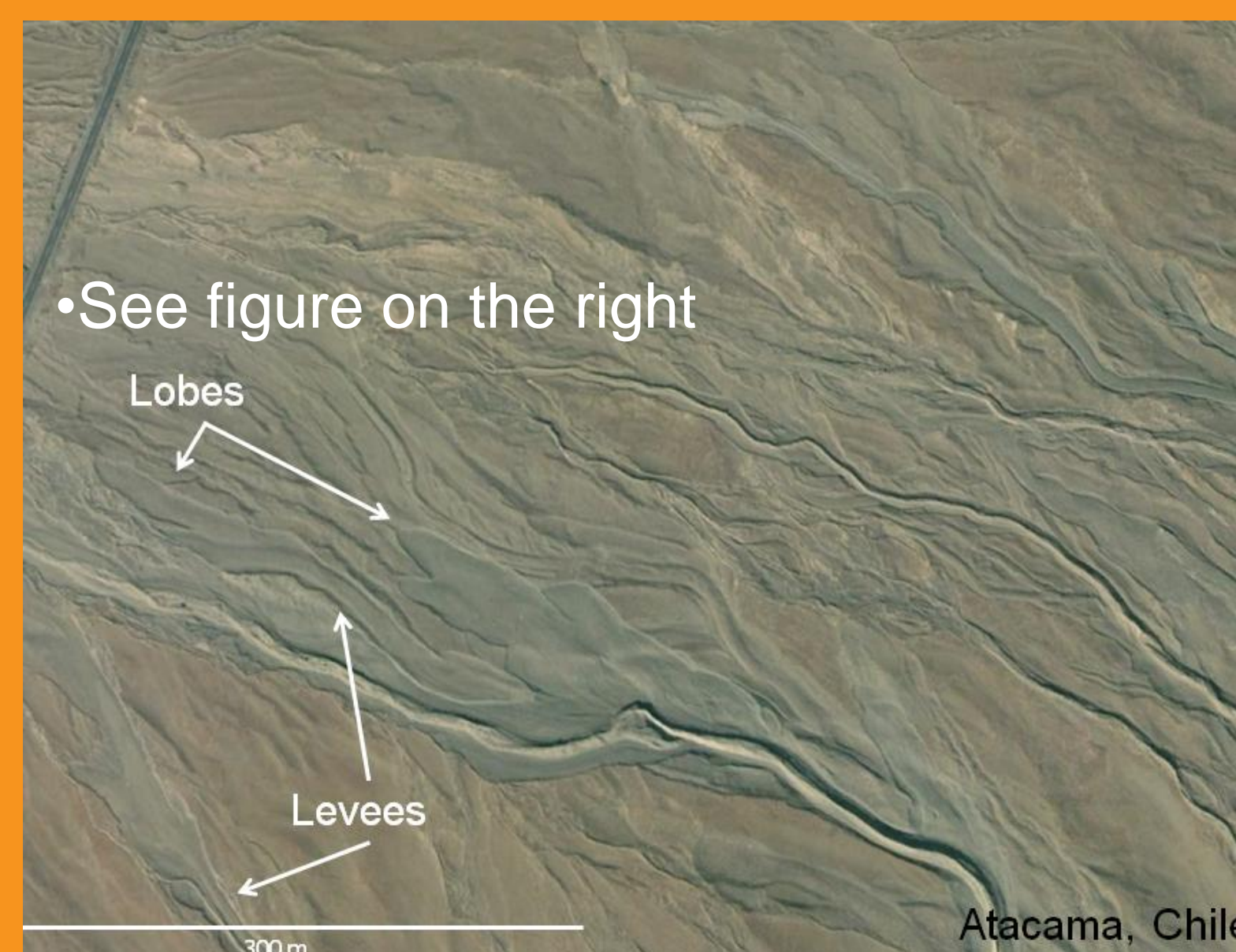


Without clay

- Optimum coarse material concentration
- Linear relation with water content
- Linear relation with channel slope
- Optimum clay concentration
- Levees and other characteristics disappear with clay removal
- Strong resemblance to natural deposits



With 2% clay

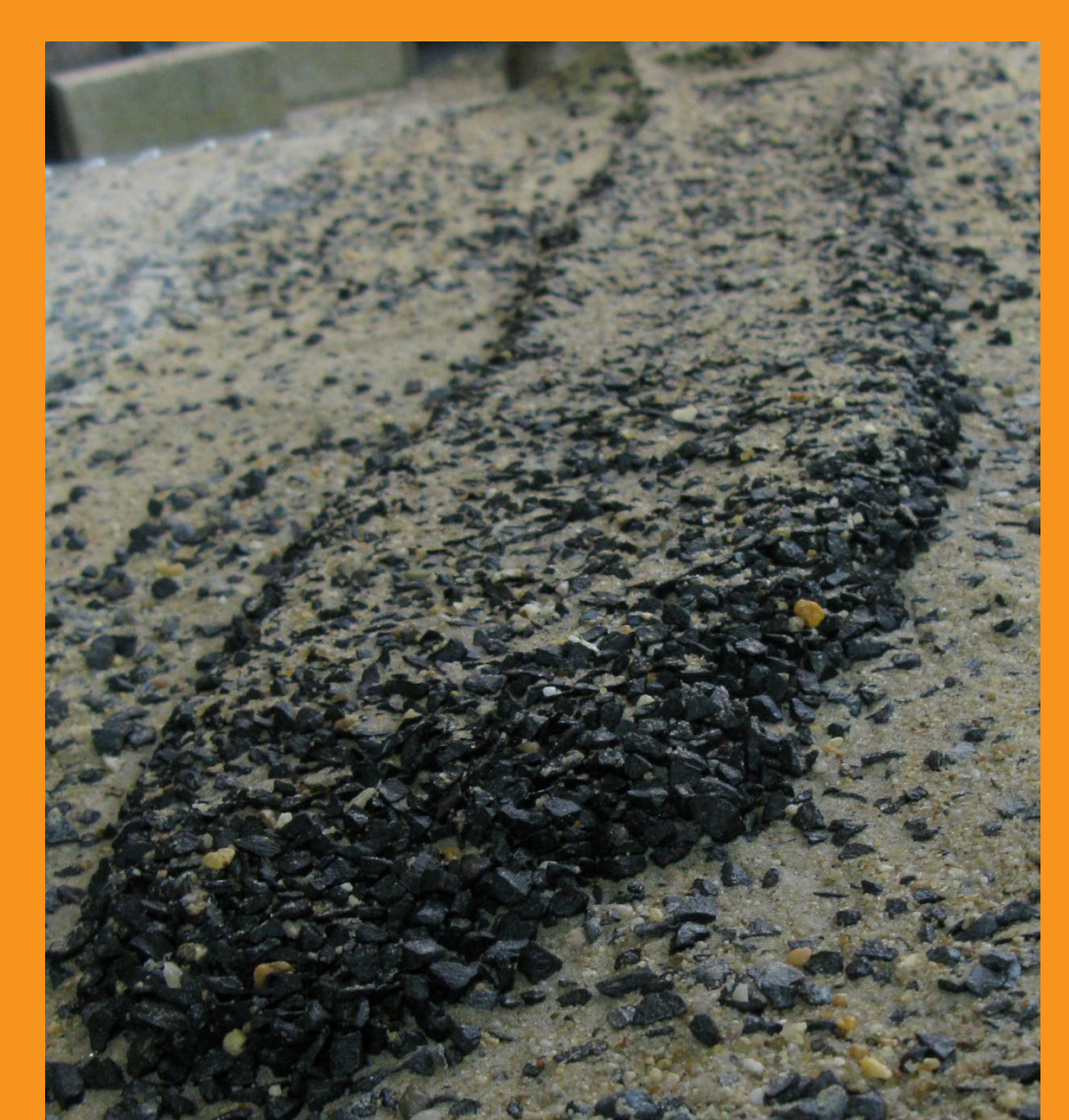


•See figure on the right

Debris fan in Chile



Lobe of the Chile fan



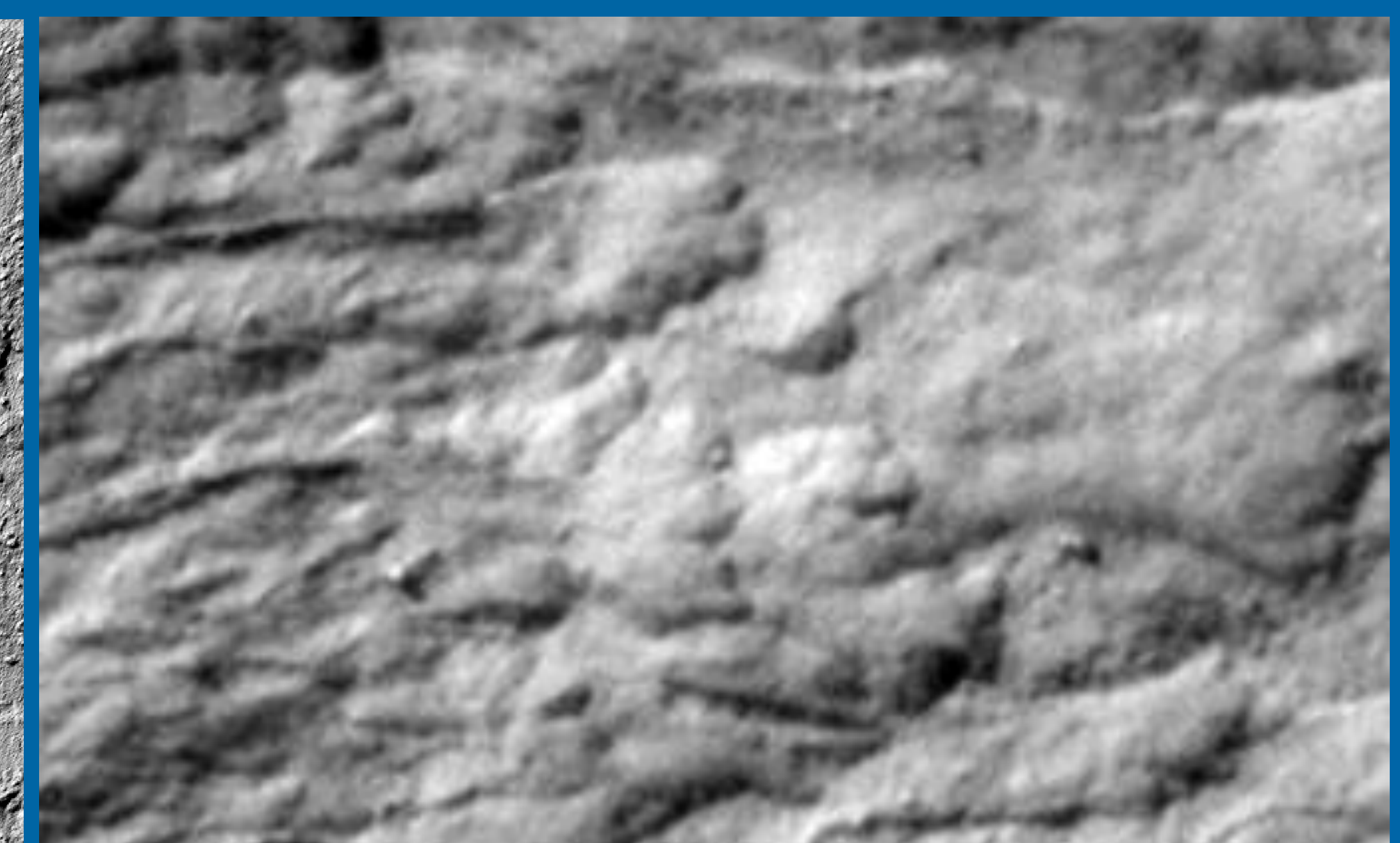
Laboratory lobe

Conclusions:

- Strong resemblance between laboratory and Martian debris-flow deposits
- As debris flows are unable to form in the absence of clay, their presence on Mars reveals the presence of clay or fine silt
- The high sensitivity of debris flows to water, clay and coarse material content allows for a reconstruction of the relative amount of these materials in debris flows on Mars
- The first ever debris-flow fan built in the laboratory will extend our knowledge on debris-flow driven fan formation



Laboratory fan



Martian fan

Acknowledgements:

Technical support from Physical Geography lab