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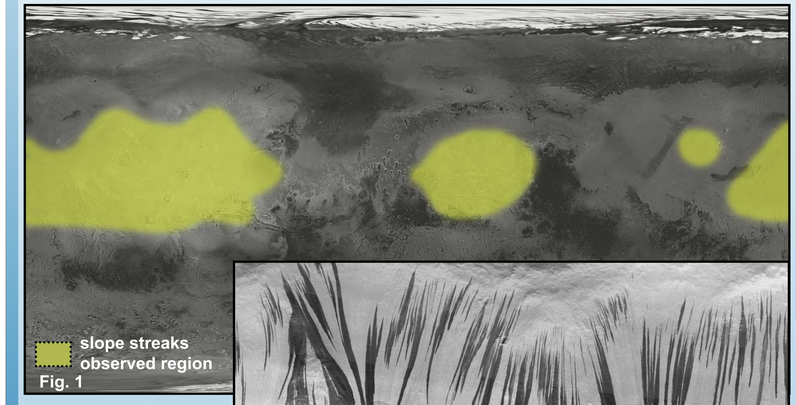
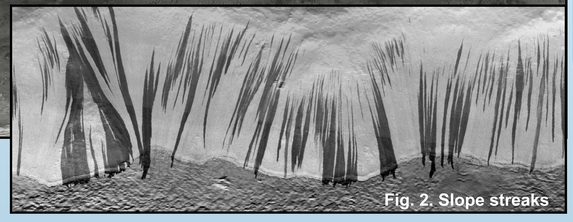
Study of Geometric Parameters of Slope Streaks on Mars.

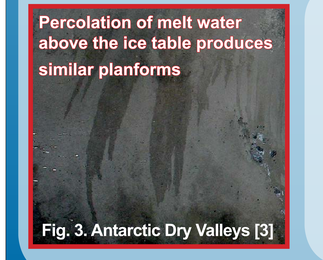
Introduction

Slope streaks are a unique active phenomenon observed in lowlatitude dusty regions on Mars (Fig.1). They are dark markings formed by an unknown type of run-away downslope propagation of surface disturbance.





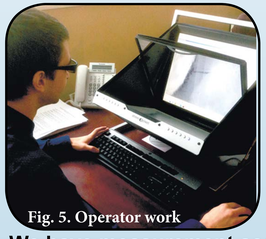
The mechanism of slope streak formation is not known, but there are two main hypotheses for their origin: «dry», a specific kind of dust avalanche that has never been observed in terrestrial and laboratory environments [1], and «wet», a specific kind of percolation of brines in the shallow subsurface [2].

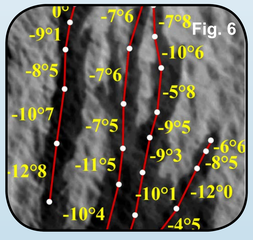


What is it?	
Different from RSL!	Type of surface layer never studied in-situ
Actively forming	No direct terrestrial or laboratory analogs
High albedo	
Dusty	No satisfactory formation mechanism
Low thermal inertia	
High H	Run-away propagation of downhill
High Cl	

Observations

We used high-resolution HiRISE stereo pairs. We measured slopes by means of PHOTOMOD software complex [5,6], which allows 2D and 3D visualization of stereo pairs.





We have measurement accuracy:
~0.5m (1 m) vertical precision
~2° (~4°) for short ~20 m slope segments.

«Wet» mechanism

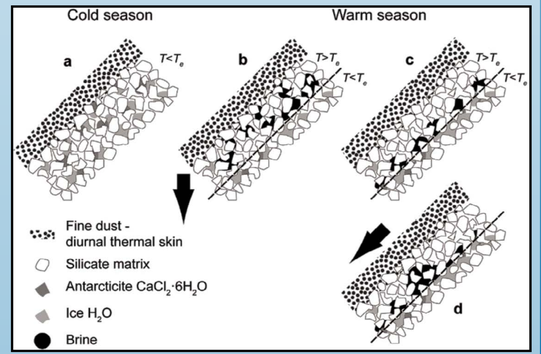
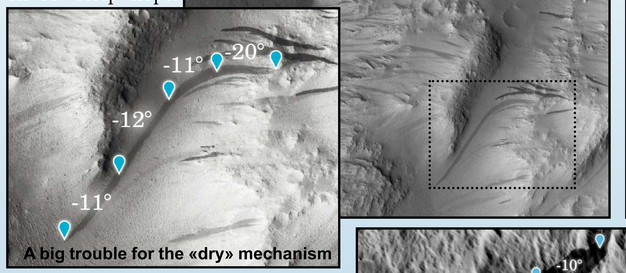
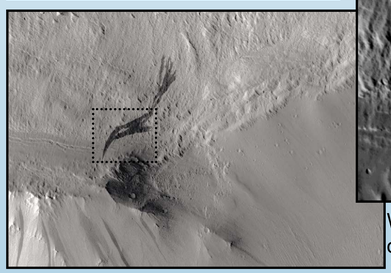


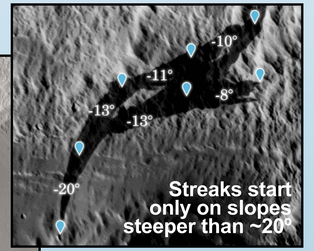
Fig. 4. «Wet» mechanism [4]

Discussion

This streak ran 400m on 11° steep slope.

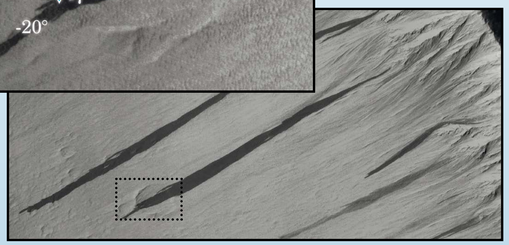


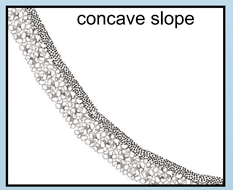




We measured slopes at streak origins for many streaks.

If a streak propagates uphill, the «wet» mechanism would be rejected. So far we have not found any convincing example of such a streak.





The average slope of all measured segments is 24.3°, while the average slope of the origination part is more, 27.8°. It's We will continue research fenomen Slope streaks.

Summary of observations	Dry	Wet
No evidence for inertia found so far	✓	✓
Streaks can propagate long distances (100s m +) on ~10° steep slopes	?	✓
Streaks can propagate only short distances (< ~50m) on <10° slopes	✓	✓
Streaks start on slopes steeper than ~20° (17° ?) only	?	✓

Future work:
- further search for evidence of inertia
- search for regional etc. variations of min origination and propagation slopes

Acknowledgments:
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References:
[1] Sullivan R. et al. (2001) JGR 106, 23,607. [2] McEwen A. et al. (2011) Science 333, 740. [3] Head et al. 2007 [4] Kreslavsky M.. and Head J. (2009) Icarus 201, 517. [5] Zubarev A. and Nadezhdina I. (2013) ISPRS Meeting of the Working Group IV/8. [6] http://www.racurs.ru/. [7] http://www.arcgis.com. [8] Miyamoto H. et al. (2004) JGR 109, E06008. [9] Kleinhans M. et al. (2011) JGR 116, E11004.