

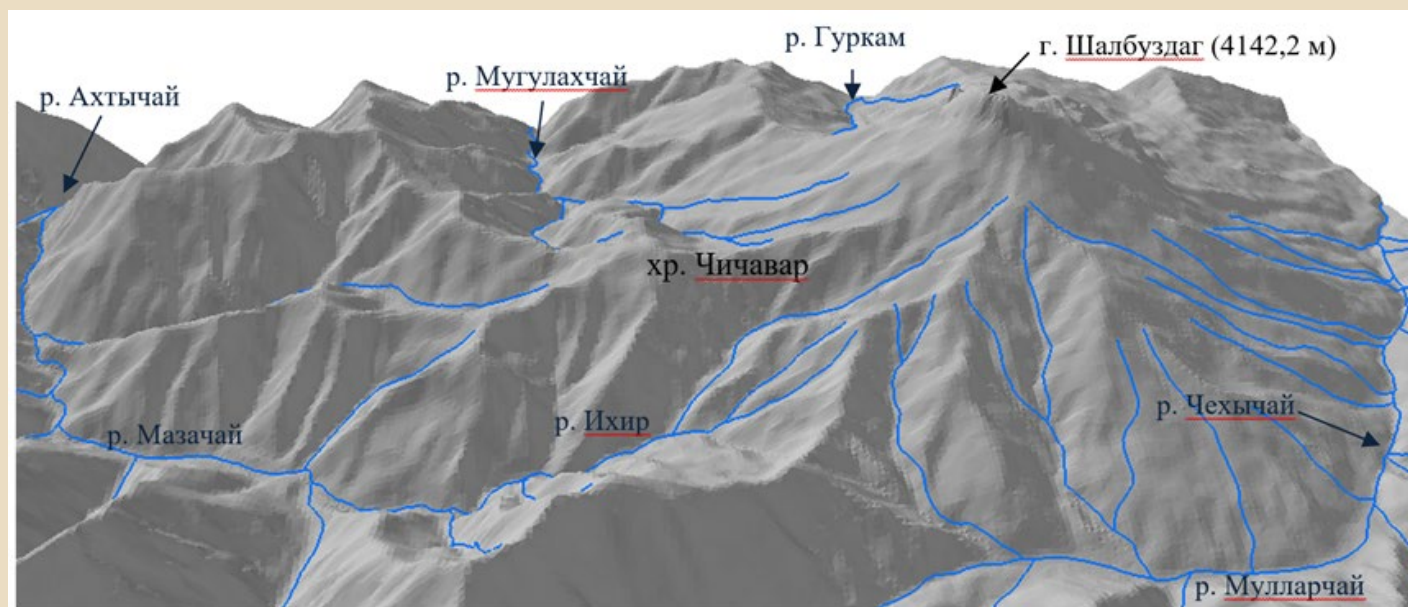


ICDF 2024
Chengdu, September, 23-27 2024

Debris flows and landslides on Mt. Shalbuzdag (Dagestan, Russia)

Elena Savernyuk, Oleg Zerkal, Sergey Chernomorets

Lomonosov Moscow State University, Moscow, Russia



Mt. Shalbuzdag

Gurkam

Ikhir

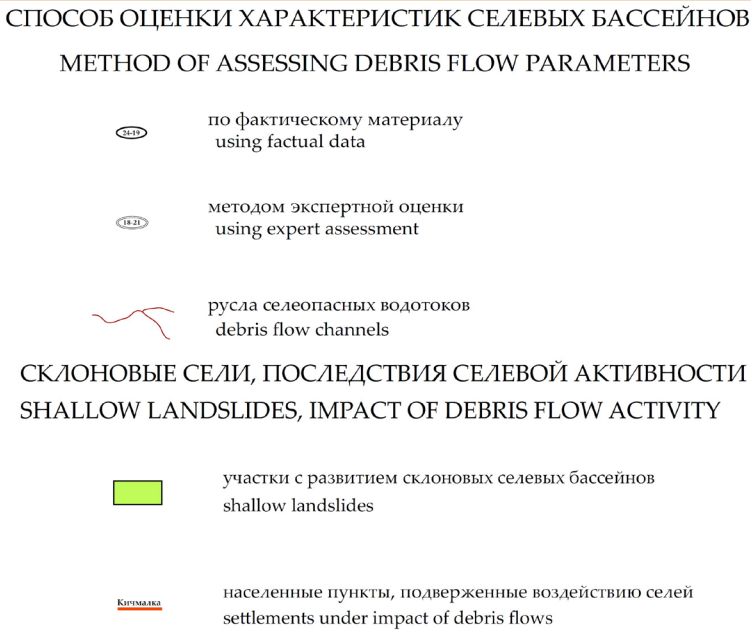
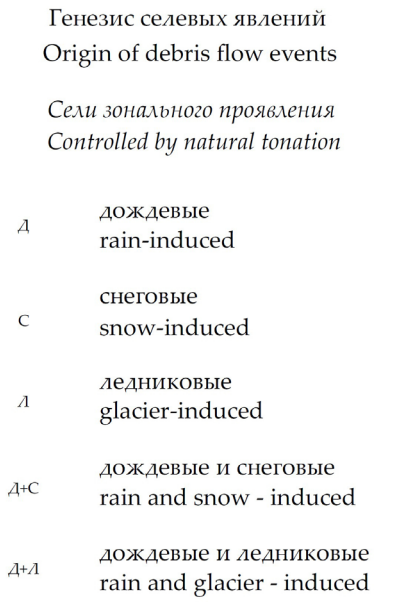
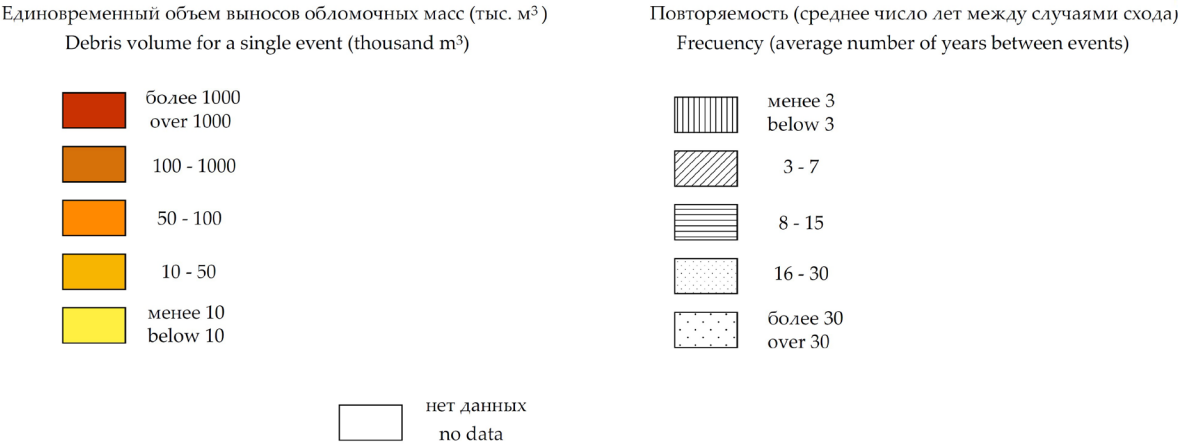


SOURCE MATERIALS

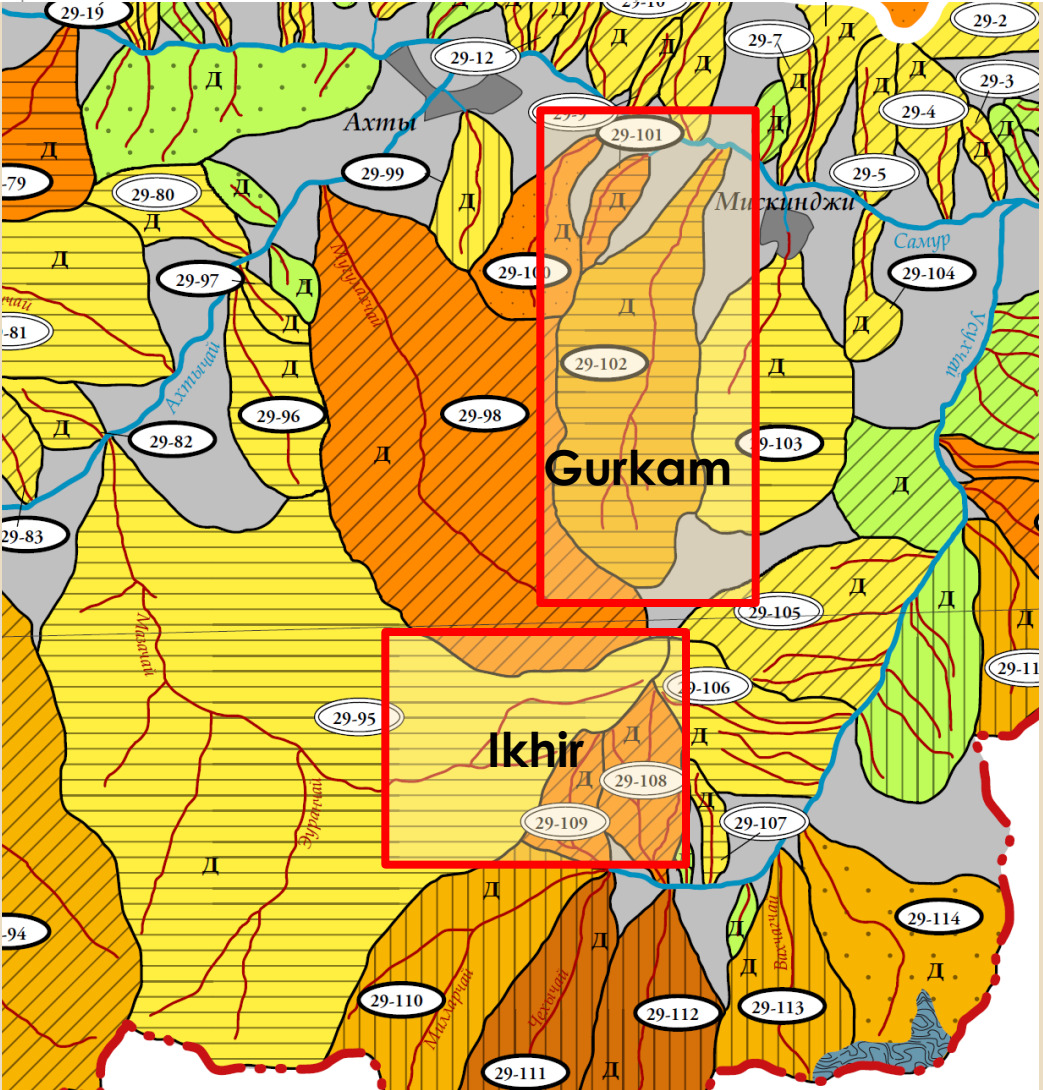
- **Maps and cadastre of debris basins developed at MSU in the 70-90s;**
- **Materials of MSU reports of 70-90s;**
- **Open satellite data: Corona KH-4A and KH-4B space images, Landsat 4, 5, 7, 8, Sentinel 1-2, Spot 1-5, SRTM, Sentinel Hub EO Browser (<https://apps.sentinel-hub.com/eo-browser/>), EarthExplorer (<https://earthexplorer.usgs.gov/>), swh Data centre (<https://regards.cnes.fr/user/swh/modules/60>));**
- **Google Earth, Bing, Yandex, Arc Imagery and more;**
- **Ground photos by tourist Mikhail Golubev;**
- **own UAV imagery**

Previous work

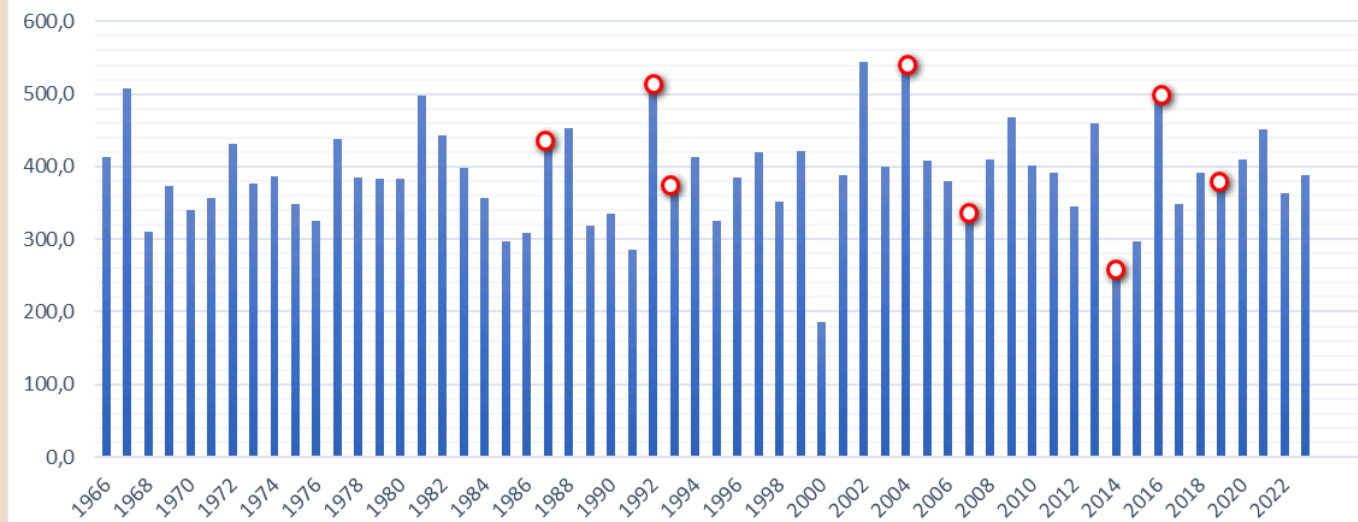
ХАРАКТЕРИСТИКА СЕЛЕВЫХ БАССЕЙНОВ CHARACTERISATION OF DEBRIS FLOW CATCHMENTS



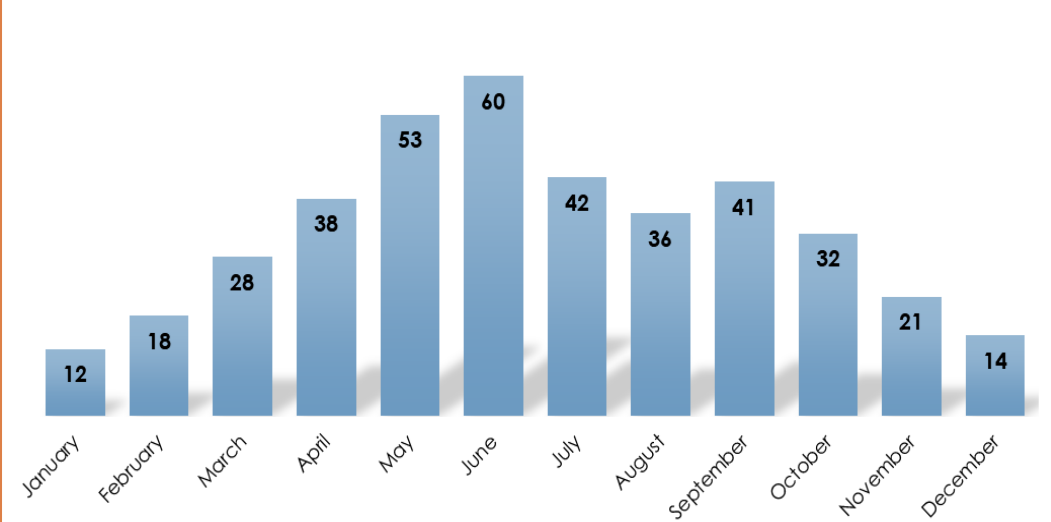
Computer map compilation of “Map of Debris Flow Catchments of North Caucasus” scale 1:200 000
Executive editor: V. F. Perov
Authors: V. F. Perov, O. I. Budarina, T. L. Sidorova, I. B. Seinova
Computer map compilation: T. I. Tuniyants
The map is produced by and deposited at the Research Laboratory of Snow Avalanches and Debris Flows, Faculty of Geography, MSU
In addition to the authors’ own data, published and unpublished sources have been used for compiling this map, including “Catalogue of Debris Flow Rivers of North Caucasus and South Caucasus” (1969), “Snow Avalanches and Debris Flows Hazard Cadastre of North Caucasus” (2001), and data of V. V. Agibalova, V. I. Voroshilov, V. A. Gerasimov, P. V. Kovalev, A. M. Lekhatinov, B. A. Paramonov, V. V. Petrasov, N. P. Streshneva, V. V. Khvorostov, I. A. Izmaylov, B. D. Tagirov, S. S. Chernomorets, and others.



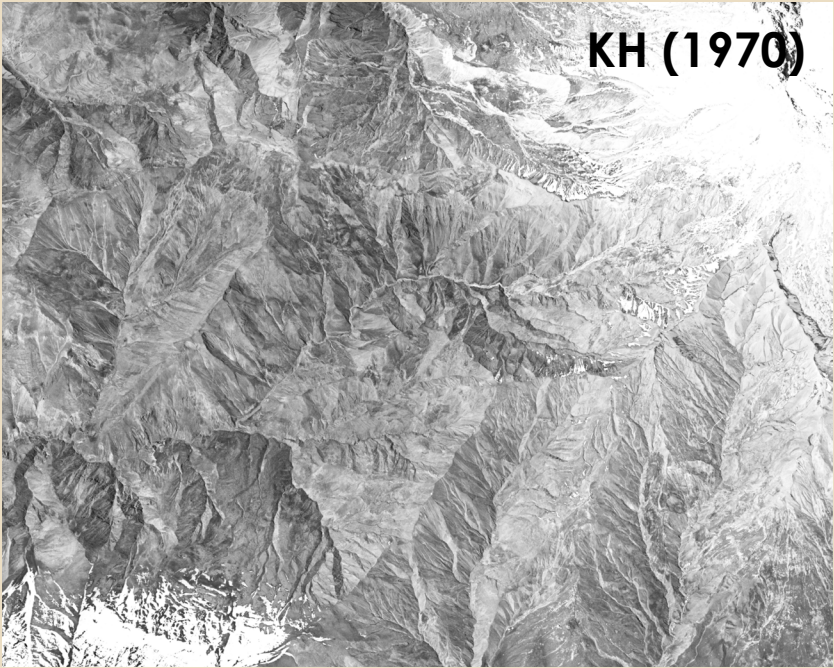
Precipitations, mm per year

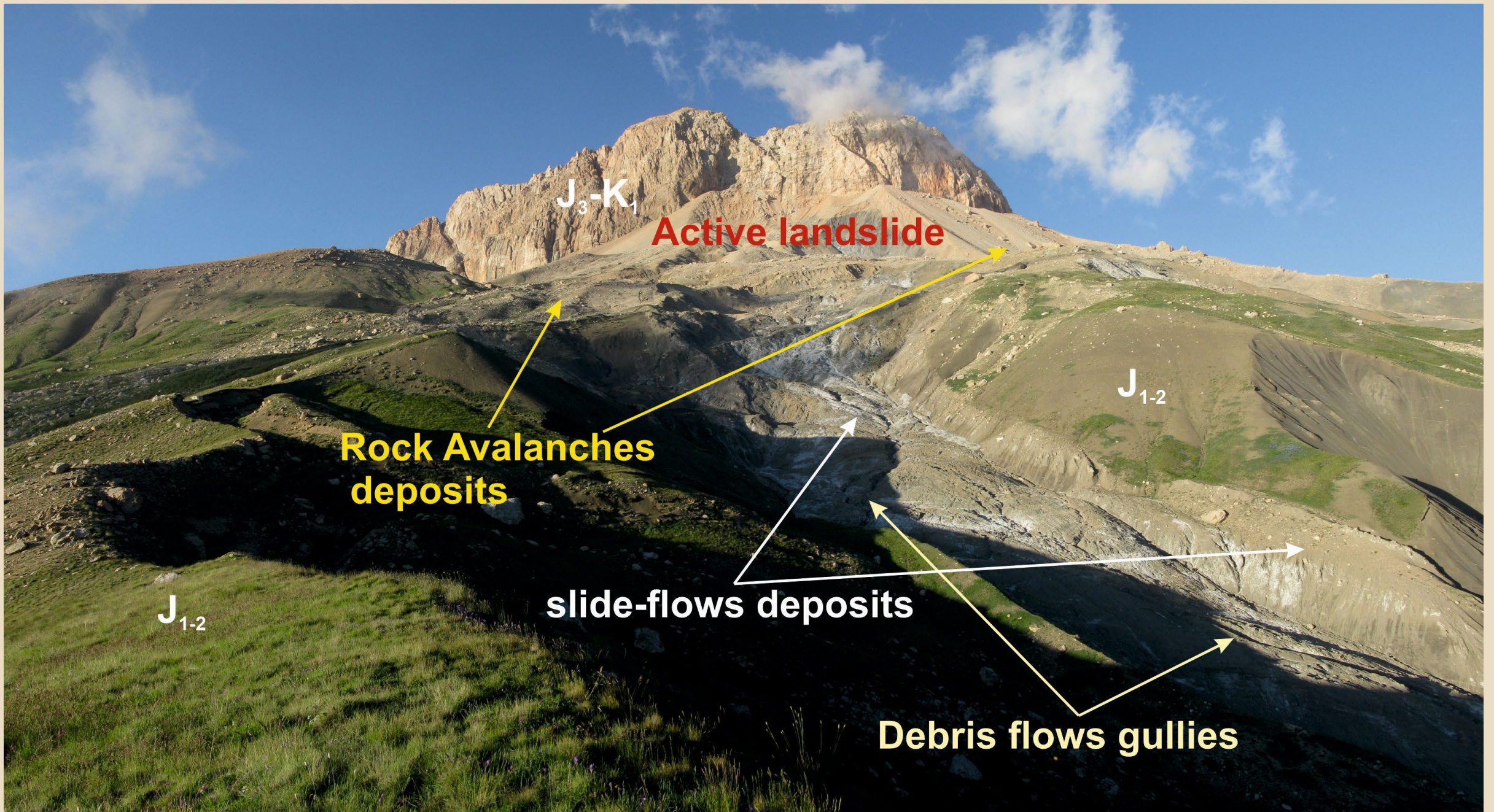


Average annual precipitation, mm



Period	Satellite imagery period	Impact area, x10 ³ m ²	Heigh of initiation site, m	Height at which sedimentation stopped, m	Horizontal distance, m	Difference, m	Slope angle, degrees	Tangent of slope angle	Presence of debris flow tracks
1	24.05.1970-02.09.1986	103	3350	2890	1340	460	18,900	0,343	
		13	3425	3320	240	105	23,600	0,437	
		82	3500	3200	970	300	17,200	0,309	
		115	3550	3260	850	290	18,800	0,341	
2	04.05.1987-25.06.1987	104	3320	2700	1430	620	23,400	0,433	
3	13.09.1990-16.07.1992	56	3300	3070	630	230	20,000	0,365	
4	01.06.1993-19.07.1993	143	3330	2565	2730	765	15,600	0,280	
5	07.06.2004-25.06.2004	144	3860	3420	1580	440	15,600	0,278	Yes
6	01.07.2004-04.07.2004	230	3410	2550	3000	860	16,000	0,287	Yes
7	17.07.2004-02.08.2004	318	3490	2480	3880	1010	14,600	0,260	Yes
8	10.07.2007-11.08.2007	328	3520	2540	3320	980	16,400	0,295	
9	03.06.2014-19.06.2014	191	3430	2620	2450	810	18,300	0,330	
10	13.06.2016-18.07.2016	290	3510	2650	2500	860	19,000	0,344	Yes
11	15.03.2020-10.09.2021	50	3810	3570	450	240	27,000	0,510	
	Average	155,0	3487,0	2917,0	1812,0	570,0	19,0	0,3	
	Maximum	328,0	3860,0	3570,0	3880,0	1010,0	27,0	0,5	
	Minimum	13,0	3300,0	2480,0	240,0	105,0	14,6	0,3	





J₃-K₁

Active landslide

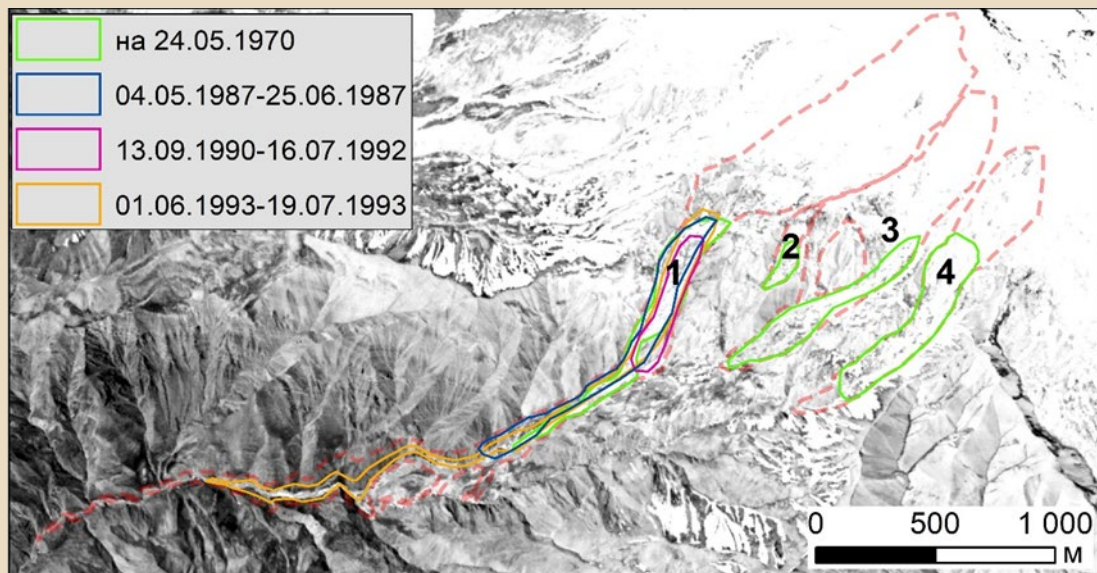
Rock Avalanches
deposits

J₁₋₂

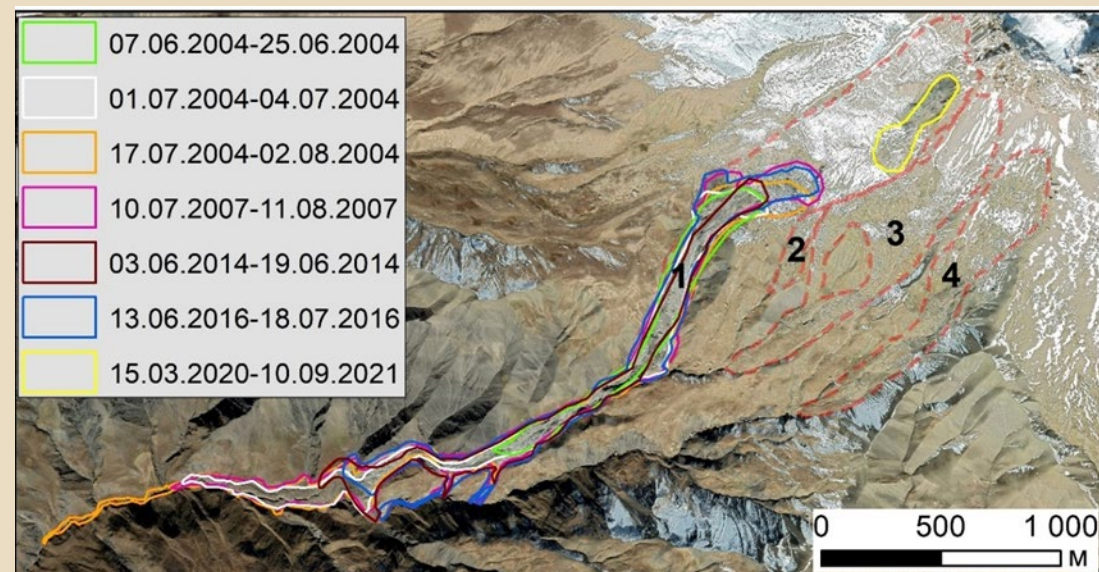
J₁₋₂

slide-flows deposits

Debris flows gullies



Landslides in 1970-1993



Landslides in 2004-2021

Ikhir River Valley

debris flow deposits and gullies

J₁₋₂

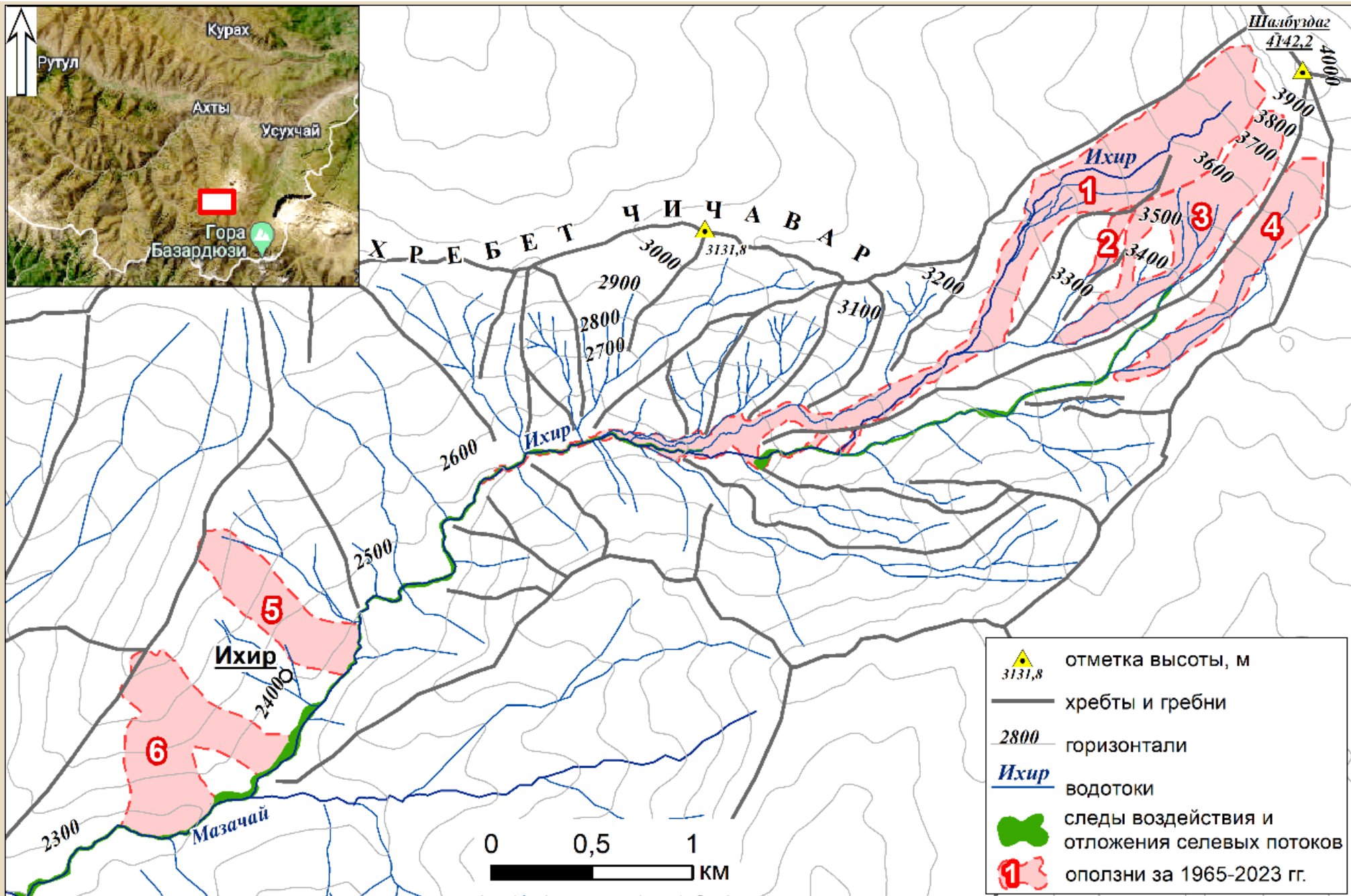
dammed lake

J₁₋₂

slide-flow deposits

Ikhir River





Gurkam River Valley







An aerial photograph showing a wide, dry riverbed with a cracked, mud-like surface. The riverbed is surrounded by sparse, green desert vegetation and a dirt road on the left. The text "Thank you for your attention" is overlaid in the lower half of the image.

Thank you for your attention

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Sergey Chernomorets