

DEBRIS FLOWS: Disasters, Risk, Forecast, Protection

Proceedings
of the 7th International Conference

Chengdu, China, 23–27 September 2024



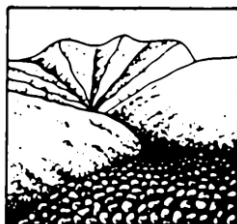
Edited by
S.S. Chernomorets, K. Hu, K.S. Viskhadzhieva

Geomarketing LLC
Moscow
2024

СЕЛЕВЫЕ ПОТОКИ: катастрофы, риск, прогноз, защита

Труды
7-й Международной конференции

Чэнду, Китай, 23–27 сентября 2024 г.



Ответственные редакторы
С.С. Черноморец, К. Ху, К.С. Висхаджиева

ООО «Геомаркетинг»
Москва
2024

泥石流： 灾害、风险、预测、防治

會議記錄

第七届国际会议

中国成都, 2024年9月23日至27日



編輯者

S.S. Chernomorets, K. Hu, K. Viskhadzhieva

Geomarketing LLC

莫斯科

2024

УДК 551.311.8
ББК 26.823
С29

Debris Flows: Disasters, Risk, Forecast, Protection. Proceedings of the 7th International Conference (Chengdu, China). – Ed. by S.S. Chernomorets, K. Hu, K.S. Viskhadzhieva. – Moscow: Geomarketing LLC. 622 p.

Селевые потоки: катастрофы, риск, прогноз, защита. Труды 7-й Международной конференции (Чэнду, Китай). – Отв. ред. С.С. Черноморец, К. Ху, К.С. Висхаджиева. – Москва: ООО «Геомаркетинг», 2024. 622 с.

泥石流：灾害、风险、预测、防治。 會議記錄 第七届国际会议. 中国成都。 編輯者 S.S. Chernomorets, K. Hu, K.S. Viskhadzhieva. – 莫斯科: Geomarketing LLC. 622 p.

ISBN 978-5-6050369-6-8

Ответственные редакторы: С.С. Черноморец (МГУ имени М.В. Ломоносова), К. Ху (Институт горных опасностей и окружающей среды Китайской академии наук), К.С. Висхаджиева (МГУ имени М.В. Ломоносова).

Edited by S.S. Chernomorets (Lomonosov Moscow State University), K. Hu (Institute of Mountain Hazards and Environment, CAS), K.S. Viskhadzhieva (Lomonosov Moscow State University).

При создании логотипа конференции использован рисунок из книги С.М. Флейшмана «Селевые потоки» (Москва: Географгиз, 1951, с. 51).

Conference logo is based on a figure from S.M. Fleishman's book on Debris Flows (Moscow: Geografgiz, 1951, p. 51).

© Селевая ассоциация

© Debris Flow Association



Contents

Preface	vii
Influence of degradation of mountain glaciation of Mount Elbrus on debris flow activity .10 <i>A.Kh. Adzhiev, N.V. Kondratyeva</i>	
Spread and features of the manifestation of debris flows at the all-season tourist and recreational complex “Mamison”	17
<i>A.Kh. Adzhiev, N.V. Kondratyeva, A.L. Kortiev, Z.M. Kerefova</i>	
Assessment of debris flow risk on population settlement in mountain regions of Azerbaijan (a case of the Shinchay River basin)	28
<i>S.O. Alekperova</i>	
Tectonic structures in the Kolka Glacier area and their influence on the development of exogenous and endogenous processes	38
<i>A.F. Baranovsky, E.V. Zaporozhchenko</i>	
Extraordinary debris flows in the Caucasus in 2022–2023	50
<i>M.Yu. Bekkiev, M.D. Dokukin, R.Kh. Kalov, A.R. Akaev</i>	
Interannual and intraannual variability of debris flow activity in the Ile Alatau Mountains	60
<i>V.P. Blagoveshchensky, A.R. Medeu, T.S. Gulyaeva, S.U. Ranova, T.L. Kirenskaya</i>	
Debris flow protective structures installation in narrow right of way	68
<i>I.S. Bogdanov, P.A. Alexandrov</i>	
Applicability of a rainfall-induced debris flow warning model: A case from Typhoon Khanun in Nantou County, Taiwan, 2023	77
<i>J.C. Chen, W.S. Huang, X.Z. Lai, J.Q. Fan, F.B. Li, G.L. Li</i>	
Vegetation recovery and debris flow effects following tropical cyclone-induced disturbances in Eastern Cuba	84
<i>R. Delgado-Téllez, N. Viña-Dávila, A. Peña-de la Cruz, Y. Savón-Vaciano</i>	
Debris flow and flood phenomena on the territory of the Republic of Uzbekistan: Experience in using tools for assessing the risk of flash floods (FFGS)	86
<i>I.V. Dergacheva, A.S. Merkushkin, F.S. Agzamov, S.S. Myagkov, K.V. Dergachev</i>	
High-mountain lakes of Uzbekistan and transboundary territories as a potential source of debris flows	94
<i>I.V. Dergacheva, M. Mirjaparov, Z.D. Tillahodjaeva, S.V. Myagkov</i>	
Methodology for assessing debris flow hazard (a case of the Western Caucasus, Sochi region)	104
<i>E.V. Dzaganiia, K.G. Samarkin-Dzharskii, L.M. Samarkina-Dzharskaia</i>	



Infrastructure safety in Russian mountains: From debris flow assessment to technical mitigation	115
<i>E. Garova, S. Fuchs, B. Chadromtsev, A. Pedanov, P. Grebennikov, I. Iltuganov, P. Lobanov, P. Ponomarjovs</i>	
Forecasting of debris flow processes and control with innovative construction along the Military Georgian Road	125
<i>G.V. Gavardashvili</i>	
Increased risks of man-made disasters due to global climate change	134
<i>Z.Zh. Gergokova</i>	
Weather background analysis of debris flows in southeastern Guizhou, China	140
<i>Y. Gou, H.M. Gao, Y.T. Song</i>	
AI landslide susceptibility mapping and statistical interpretation in the Mediterranean coastal zone between Oued Laou and El Jebha, Morocco	147
<i>H. Harmouzi, A. Dekayir, H.A. Nefeslioglu, M. Rouai, E.A. Sezer, C. Gokceoglu</i>	
Evaluating earthquake-induced landslide potential under different scenarios using empirical landslide fragility model – A case study on Taiwan	157
<i>M.H. Hsieh</i>	
Effects of structure conservation implementation on landslide and debris flow hazards: A case study in Chenyulan watershed, Taiwan	166
<i>W.S. Huang, J.C. Chen, J.Q. Fan, X.Z. Lai, F.B. Li, G.L. Li</i>	
Characteristics of the debris-flow-triggering rainfalls recorded in the Shenmu area of Central Taiwan: An update	179
<i>Y.M. Huang, S.L. Chen, Y.M. Fang</i>	
Detecting the debris flow frontal velocity by the mud droplets impinging on rigid surfaces	189
<i>K.L. Huang, H.T. Chou</i>	
Reconstruction of the October 2022 debris flow in the Sultan-Gara-Su River valley (Malka River basin, Elbrus Mountain)	200
<i>V.A. Iudina, E.A. Savernyuk, K.S. Viskhadzhieva, E.G. Khar'kovets, S.S. Chernomorets</i>	
Features of integrated monitoring of debris flows hazard to justification for engineering protection (a case study of South-Eastern Crimea)	212
<i>T.A. Ivanenko, N.M. Vetrova, A.A. Gaysarova</i>	
Investigating the influence of groundsill array density on debris flow behavior using numerical simulations.....	224
<i>C.-D. Jan, Y.-C. Zeng, L. Dey</i>	
Debris flow as the final process in the cycle of extreme exogenous processes in mountain landscapes.....	226
<i>V.A. Karavaev, A.S. Gorbunov, A.V. Voskova, S.A. Bulanov, A.N. Gunya, S.S. Seminozhenko, M.N. Petrushina</i>	



About the main natural threats and risks in Tajikistan.....	232
<i>F.A. Karieva, A.A. Gulakhmadov</i>	
Analysis of the surging of the Medvezhiy Glacier on Pamirs.....	238
<i>F.H. Karimov</i>	
Calculation, mapping and risk assessment of debris flow vulnerability in the Baksan River basin (Kabardino-Balkarian Republic)	252
<i>A.M. Kerimov, Z.T. Akshayakov, O.A. Kurasheva, A.B. Ashabokov</i>	
How do climate change and deglaciation affect the runoff formation mechanisms in the high-mountain river basins of the North Caucasus?	260
<i>E.D. Kornilova, I.N. Krylenko, Yu.G. Motovilov, E.P. Rets, I.A. Korneva, T.N. Postnikova, O.O. Rybak</i>	
Natural debris flows in the Western Caucasus, Sochi area	262
<i>V.I. Krylenko, I.V. Krylenko, E.V. Dzaganiia, M.Yu. Dzaganiia</i>	
Streamflow formation of the rock glacier creeks in the Northern Tien Shan, Republic of Kazakhstan	273
<i>L.S. Lebedeva, V.V. Goncharenko</i>	
Hazard potential change for rain-induced debris flow in silty clay mudstone environment after large earthquake and continuous rainfall sediment deposit.....	285
<i>B.-S. Lin, H.-C. Hsu, W.-Y. Chiu, F.Y. Kuo</i>	
Intelligent debris flow monitoring and warning system	302
<i>K.-F. Liu, S.-C. Wei</i>	
Analysis of debris flow formation conditions in the Elbrus region in the 21st century ...	307
<i>I.V. Malneva, M.D. Dokukin, M.A. Anaev, M.M. Khadzhiev</i>	
Development of debris flow processes in the Goshgarchay River basin (a case of the northeastern slope of the Lesser Caucasus, Azerbaijan)	316
<i>S.A. Mamiyeva</i>	
Risk assessment of debris flows in vulnerable areas.....	327
<i>S.I. Matsiy, U.R. Sidaravičute, V.S. Matsiy</i>	
Experience of creation of complex protection from debris flows of the key section of Ile Alatau (a case of the Ulken River basin, Almaty)	334
<i>A.R. Medeu, N.V. Popov, S.U. Ranova, A.N. Kamalbekova, U.R. Aldabergen</i>	
Approach to flash flood risk assessment for the problematic territories in Uzbekistan ..	336
<i>A.S. Merkushev, G.N. Trofimov, S.I. Klimov</i>	
Features of debris flows formation in the Shakhe River basin (Northwest Caucasus) and assessment of the possibility of their transformation into turbid flows in the coastal zone of the Black Sea.....	338
<i>S.G. Mironyuk, Yu.V. Efremov</i>	



Debris flow phenomena and their assessment using geoinformation system technologies for the development of the tourist industry of Uzbekistan	349
<i>A.N. Nigmatov</i>	
MODIS imagery-based water content forecasting methodology for the Kyzylsu River	359
<i>J.B. Niyazov, O.Yu. Kalashnikova</i>	
Debris flows and climate dynamics in natural areas of Eastern Cuba.....	367
<i>A. Peña-de-la-Cruz, R. Delgado-Téllez, M. Ding, Y. Savón-Vaciano</i>	
Debris flows as triggers of accidents in the infrastructure.....	376
<i>E.G. Petrova</i>	
Structural features of ancient debris flow cones in the upper part of the Mzymta River valley	384
<i>A.A. Ponomarev, A.A. Ponomarev, O.V. Zerkal</i>	
Experience of the Aga Khan Agency for Habitat (AKAH) in glacial lakes' analysis and their outbursts' simulations in Tajikistan	394
<i>Yu.Kh. Raimbekov, Kh.A. Imronshoev</i>	
Debris flow processes on Arctic islands.....	401
<i>F.A. Romanenko</i>	
Features of the formation of debris flow-prone areas in the transition zones "mainland – ocean" (a case of the of Sakhalin Island).....	408
<i>S.V. Rybalchenko</i>	
Gullies and landslides as one of the factors of debris flows occurrence in the conditions of plain territories.....	418
<i>I.I. Rysin, I.I. Grigoriev</i>	
Debris flow phenomenon: A potential outcome of the changing climatic pattern in Northern Pakistan.....	429
<i>S. Sadiq, M.A. Janjua, H. Ali, A.A. Awan</i>	
Mapping the territories of the mountain-foothill zone of Tajikistan exposed to natural hazards	445
<i>M. Safarov, A. Fazylov, S. Kang, M. Gulayozov, H. Navruzshoev, A. Banerjee, Y. Mamadjonov</i>	
Debris flows in the Ikhir River valley (Mt. Shalbuzdag, Dagestan, Russia) and their relationship with landslides.....	458
<i>E.A. Savernyuk, O.V. Zerkal, S.S. Chernomorets</i>	
Deciphering the interplay of surface velocity and flow height in natural debris flows: Field observations from the Illgraben, Switzerland.....	470
<i>T. Schöffl, B. McArdell, R. Kaitna, R. Koschuch, J. Hübl</i>	
Improvement of technologies for accounting and storing data about debris flow events	479
<i>A.Kh. Sherkhov</i>	



Ultra-short-term forecast for debris flows induced by rainfall	485
<i>B.S. Stepanov, R.K. Yafyazova</i>	
Thick alluvial fans – indicator of the past rivers’ damming	487
<i>A.L. Strom</i>	
Assessment of landslide susceptibility of debris flow hazardous of Shamakhi administrative district of Azerbaijan (based on ArcGIS).....	489
<i>S.A. Tarikhazer</i>	
Radioactive debris flows in the valley of the Mailuu-Suu River (Kyrgyzstan).....	500
<i>I.A. Torgoev, Yu.G. Aleshin</i>	
Evaluation of decadal rainfall variability’s effect on debris flow intensity and frequency in the Brep Area of Chitral, Pakistan.....	511
<i>N. Uddin, L. Ali, Z. Uddin</i>	
Glacial lake outbursts: A case of the Spartakovskoe Lake. Study methods and forecasting features	517
<i>L.N. Ulaeva</i>	
Cascading mode of landslide and debris flow processes in the Valley of Geysers (Kamchatka, Russia)	526
<i>O.V. Zerkal, O.S. Barykina, J.V. Frolova, I.E. Bolshakov</i>	
Characteristics, driving factors of spatial and temporal variations and tendency of debris flows in the Yunnan section of the Salween River mainstream	535
<i>J. Zhang, D. Yang, B. Gao, L. Chen, Y. Li, Y. Tian, H. Huang, H. Li, J. Li, Y. Li</i>	
Numerical modeling of waves caused by a landslide or debris flow in a reservoir.....	550
<i>L. Zhao</i>	
Meteorological conditions of the formation of water-ice debris flows on mountain rivers of Ile Alatau.....	563
<i>V.V. Zhdanov, N.U. Kuzhageldina</i>	
Securing landslides with pile structures	572
<i>Yu.A. Mazhaisky, N.V. Sheshenev</i>	
Simulation analysis of debris flow caused by dam break in construction waste disposal site based on EDDA.....	577
<i>K. He, F. Chen, H. Lu, J. Ma</i>	
Extreme rainfall event affecting a Brazilian Pipeline – emergency evaluation and mitigation works	578
<i>H.R. Oliveira, P.V.S. Mascarenhas, J.D.G. Neto, T.C. Santos, W.C. Russo Jr</i>	
Trends in changes in debris flow hazard caused by climate change in the subtropical zone of the Caucasus	580
<i>L.M. Dzaganiia, E.V. Dzaganiia, G.N. Sukharzhevskii, V.S. Brigida</i>	



Mountain debris flows on the northern slope of the Khamar-Daban Range in 2019	591
<i>A.A. Rybchenko, A.V. Kadetova, A.A. Yuryev</i>	
Author's Index	596
Contents	606