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THE 5TH CONFERENCE ON “DEBRIS FLOWS: DISASTERS, RISK, FORECAST, PROTECTION” (TBILISI, GEORGIA)

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EXTENDED ABSTRACT

Nella città di Tbilisi, capitale della Georgia, si è tenuta tra l'1 ed il 5 ottobre 2018 la 5th Conference on Debris Flows: Disasters, Risk, Forecast, Protection (V Conferenza su “Le colate detritiche: disastri, rischio, previsione, protezione) promossa e presieduta dal prof. Sergey Chernomorets dell'Università Statale Lomonosov di Mosca e Presidente della *Debris Flow Association* e dal prof. Givi Gavardashvili dell'Istituto Tsotne Mirtskhulava Water Management della *Georgian Technical University* (Tbilisi, Georgia), sponsorizzata dal Ministero dell'Ambiente della Georgia, dall'UNESCO e da numerose altre organizzazioni nazionali ed internazionali.

La Conferenza è l'ultima di una serie iniziata nel 2008 a Pyatigorsk (Russia) e successivamente tenute sempre in Russia a Mosca (2012), Yuzhno-Sakhalinsk (2014), Irkutsk & Arshan (2016).

Gli studi sulle colate detritiche, che iniziarono nell'Impero Russo nella seconda metà del XIX, si svilupparono successivamente nell'Unione Sovietica e molte conferenze (24 tra il 1949 ed il 1982) furono organizzate da esperti provenienti da molti Paesi (Kazakhstan, Georgia, Russia, Armenia, Ukraine, Azerbaijan, Kyrgyzstan and Tajikistan).

Nel 2005 è stata fondata a Pyatigorsk l'Associazione Russa delle Colate Detritiche (*Debris Flow Association, DFA*), una società di esperti alla quale hanno aderito successivamente altri studiosi, raggruppando oggi più di 160 esperti di 23 differenti Paesi.

La Conferenza, tenuta presso la *Georgian Technical University* in Tbilisi, ha richiamato circa 200 studiosi e ricercatori provenienti dall'Europa, dall'Asia, dall'Africa e dal Brasile. Nei primi tre giorni sono stati presentati 96 lavori, di cui 75 orali e 21 poster, in gran parte da giovani ricercatori. Nei due giorni successivi sono state organizzate due gite scientifiche nella regione di Kakheti e lungo la *Georgian Military Road* nelle quali sono stati visitati alcuni importanti torrenti interessati da colate detritiche e dove sono state realizzate importanti strutture per lo studio delle colate detritiche e la progettazione di opere di difesa. Queste escursioni sono risultate in rilevanti seminari pratici: nei bacini visitati sono state fatte osservazioni dirette per alcune decine di anni, accompagnate da esperimenti per la progettazione di strumentazioni idonee allo studio di colate detritiche in sito e di strutture di mitigazione del rischio.

In totale sono stati presentati 96 articoli di cui 75 orali e 21 come poster, suddivisi in 3 giorni e 10 differenti sessioni tematiche: 1) riduzione del rischio; 2) clima e colate detritiche; 3) disastri da colate detritiche; 4) mitigazione e monitoraggio; 5) valutazione della pericolosità; 6) modellazione di colate detritiche e di piene; 7) formazione di colate detritiche in ambienti differenti; 8) analisi regionali; 9) gestione del rischio e processi decisionali; 10) metodi e risultati di indagini sulle colate detritiche.

I 77 articoli pubblicati negli Atti della Conferenza, di cui 50 in lingua russa, con riassunto in inglese, e 27 in inglese, con riassunto in lingua russa, contengono significativi risultati sui principali aspetti e problemi delle colate detritiche e sulle applicazioni ingegneristiche e riflettono lo stato dell'arte delle ricerche attualmente in corso. Sono stati presentati e discussi lavori a livello regionale e globale condotti sui molti disastri avvenuti, sulla previsione e modellazione, sulla pericolosità in particolare da rotture di laghi glaciali e sulla progettazione di opere di prevenzione e difesa. Sono stati presentati anche lavori sui metodi di controllo delle colate detritiche, sulla progettazione di misure di mitigazione del rischio e sugli standard e la normativa. Le aree di studio interessano un territorio estremamente esteso che va dall'Europa centrale ed occidentale, al Caucaso, alla Siberia, all'Asia, al Nord Africa, al Sud America, sino all'Artico ed all'antartico. L'interesse per tali studi è sottolineato dall'elevato numero di organizzazioni che hanno collaborato alla Conferenza.

Lavori presentati e le successive discussioni collegiali hanno sottolineato in particolare la rilevanza degli studi basati su osservazioni sistematiche di campo e su una modellazione realistica dei fenomeni, cos' da ottenere risultati utili per la previsione e la progettazione di efficaci sistemi di allarme.

Il successo della V Conferenza ha spinto il Comitato Organizzatore a tenere una prossima Conferenza nel 2020 nel Tagikistan in data da stabilire a breve.

Gli Atti della Conferenza sono stati pubblicati dalla *Universal Publishing House* (Tbilisi, Georgia; CHERNOMORETS S.S. & GAVARDASHVILI G.V. Eds.), ISBN: 978-9941-26-283-8, e dalla rivista russa *Georisk Journal*.

THE CONFERENCE

Debris flows are mass movements involving water-charged, predominantly coarse-grained soil flowing rapidly down in a preexisting channel or on a natural slope, evolving as pulsating, unsteady non uniform flows moving as a single wave or a series of surges. These phenomena are amongst the most destructive of all water-related disasters, likely to become more frequent and more important in the future due to the effects of the increase in population, urbanization, and the impact of climate change.

The related hazard is to be considered very high due to their poor predictability, high impact forces, and capacity to deposit large quantities of sediment.

In mountain regions, they cause significant damage to economy and quite often lead to victims among the population. Mitigation structures may be, then, required to minimize the risk to people and infrastructures on alluvial fans and, consequently, they have attracted more and more attention from the scientific and professional communities in order to cope with debris flow occurrence and get a consonant balance between the environment and economic possibilities. The solution of debris flows problems requires, definitely, the cooperation of experts with different skills and from different countries comparing knowledge and experiences: international meetings represent a direct and effective means to get these goals.

An International Conference on these themes took place in Tbilisi (Georgia) on October 1-5, 2018: the “5th International Conference on Debris Flows: Disasters, Risks, Forecast, Protection”, co-chaired by Prof. Sergey Chernomorets (Lomonosov Moscow State University and President of the Debris Flow Association) and Prof. Givi Gavardashvili (Tsoetne

Mirtskhulava Water Management Institute of Georgian Technical University, Tbilisi, Georgia). The Conference is cosponsored by government ministries of Georgia, by UNESCO and other international organizations that underlines the narrow bond between science and practice in debris flow studies

This Conference is the fifth of a successful series of 4 held in Russia, first started in Pyatigorsk (2008), and continued in Moscow (Russia, 2012), Yuzhno-Sakhalinsk (2014), Irkutsk and Arshan (2016). Studies of debris flows in the Russian Empire started in the second half of the 19th century, when these phenomena were indicated as “sel”, an Arabic word used in the Caucasus regions. Many conferences were organized on this topic by experts from Kazakhstan, Georgia, Russia, Armenia, Ukraine, Azerbaijan, Kyrgyzstan and Tajikistan (24 conferences in 1949–1982) and in 2005 the Russian Debris Flow Association (DFA) was founded in Pyatigorsk as a professional society of experts, subsequently joined by members from other countries. Currently, the Debris Flow Association gathers more than 160 experts from 23 countries.

The choice of Georgia as a venue of the 5th Conference is a recognition of the activity of Georgian institutions and researchers in this field. Since the middle of the 19th century, studies and researches on debris flows were carried out by the Georgian school: test catchment areas were investigated, regional maps of debris flow risk were compiled, experimental debris flow modeling in flume was undertaken, and debris flow control constructions were developed and installed.

The Georgian Technical University in Tbilisi was the venue of the Conference that was attended by nearly 200 experts from Austria, Azerbaijan, Armenia, Bulgaria, Brazil, China, France, Georgia, Germany, Great Britain, India, Italy, Kazakhstan, Morocco, Spain,



Fig. 1 - Conference participants in front of the Georgian Technical University building. Tbilisi, October 1, 2018. Photo by Georgy Daraseliya)



Fig. 2 - Conference opening ceremony. From left: Prof. F. Wei, Prof. S. Chernomorets, Prof. A. Prangishvili, Prof. G. Gavardashvili, Prof. V. Jomelli, Dr. K. Tovmasyan (Photo by Georgy Daraseliya)

Russia, Switzerland, Tajikistan, Ukraine, and Uzbekistan.

The Rector of the Georgian Technical University Prof. A. Prangishvili opened the conference mainly referring to the importance of the Conference and stressing the need to understanding the nature of regional disasters. Welcome speeches were made by Sh. Khutsishvili (Head of the Service on Emergency Management of Georgia), by O. Solomina (Director of the RAS Institute of Geography), by M. Bekkiev (Director of the Mountain Geophysical Institute), by K. Tovmasyan (Representative of UNESCO), by F. Wei (Deputy Director of the Chongqing Institute of Green and Intellectual Technologies), by V. Jomelli (National Center for the Scientific Research and University Panthéon-Sorbonne of Paris-1), by G. Gavardashvili (Georgian Technical University) and by S. Chernomorets (President of Debris Flow Association). Mr. M. Batiashvili, Minister of Education, Sciences, Culture and Sport of Georgia, visited the conference covered by the Georgian media and television.

In total 96 presentations, including 75 oral and 21 posters, presented at the Conference by both experienced and young researchers, were subdivided as follows:

- on October 1, were held the Plenary Session (Conveners G. Gavardashvili and S. Chernomorets), as well as the thematic Sessions on: “Debris flow risk reduction: from science to practice and international collaboration” (organized by UNESCO, Conveners K. Tovmasyan and G. Gaprindashvili); “Debris flows and climate” (Conveners V. Jomelli and R. Yafyazova); and, “Debris flow disasters” (Conveners F. Wei and E. Garankina);
- on October 2, were held Sessions on: “Debris flow mitigation and monitoring” (Convener A. Strom); “Debris flow hazard assessment” (Conveners A. Shnyparkov and A. Kadetova); “Modelling of debris flows and floods” (Conveners P. Bartelt and V. Kidyayeva); “Debris flow formation in different conditions”



Fig. 3 - The Duruji River (Kakheti) site of dangerous debris-flows (Photo by I.Kargapolova)



Fig. 4 - The Duruji River warning system (Photo by S. Chernomorets)

(Conveners E. Talanov & E. Kozireva); “Regional analysis of debris flows” (Conveners S. Sokratov and G. Pryakhina), and “Where will happen next disaster? Modelling future lakes for risk management and decision making” (Conveners M.



Fig. 5 - The Conference participants in the Duruji River valley (Photo by R Genevois)



Fig. 6 - The destroyed structure in the Duruji River upstream the Kvareli town (Photo by I. Kargapolova)



Fig. 7 - Mount Kazbek and the Gergeti settlement (Photo by M. Dokukin)

Shahgedanova and V. Kapitsa). The poster Session was held to present posters of the conference participants. The Georgian Technical University organized also a concert performed by the dancing staff and choir of the same University;

- on October 3, three sessions on “Methods and results of debris flow investigations” (Conveners S. Ranova, N. Kazakov, T. Vinogradova and R. Kalov) were held, followed by an open discussion and the Closing Ceremony. At the closing ceremony of the conference, the awards of Debris Flow Association (the Fleishman medal) were handed out to O. Natishvili (Georgia), R. Genevois (Italy), E. Talanov (Kazakhstan) and D. Znamensky (Brazil) for their achievements in the field of debris flows investigation and promotion of international cooperation.

Two one-day field trips were held on October 4 and 5 in Kakheti region (Telavi and Kvareli) and along the Georgian Military Road (Kazbegi). They represented important practical seminars that included the visits to debris flow basins of Georgia where several decades’ long investigations have been carried out, accompanied by experiments for the design of devices for debris flows studies and anti-debris flow works.

The conference brought together scientists and managers to discuss the latest advances in the field of debris flows and to assess debris flows hazard, improve models, develop maps, and to design preventative and mitigation measures.

The Conference Proceedings contain 77 papers of which 50 in Russian (English abstract) and 27 in English (Russian abstract).

The collected papers are addressed to the characterization of the main aspects of debris flow research and engineering applications. The papers reflect the latest developments and advances in debris-flow research and show the state-of-the-art in theory and methods used in debris flow investigation. In particular, main discussed subjects may be identified in the followings, the number of the relative papers being in parenthesis:

- global and regional debris flows analysis (n. 18);
- debris flow disasters (n. 7);
- debris flows forecast (n. 13);
- debris flows modelling (n. 9);
- glacial lakes debris flow hazard and ice-rock-water flows (n. 7);
- debris flow control actions (n. 8);
- standards and regulations (n. 2);
- design of debris-flow mitigation facilities and constructions (n. 11);
- scientific schools and traditions of debris-flow science (n. 1).

Study areas are spread on mountain territories of Western and Central Europe, Caucasus, Siberia, Far East, Central Asia, Qinghai-Tibet Plateau, Himalayas, North Africa, South America, and Arctic and Antarctic.

The combination of science and practice in debris flow studies is emphasized from the number (n. 59) of collaborative organizations.

Presentations and resulting discussions stressed that the challenge presented by the management and mitigation of debris flows can only be met by comprehensive studies based on systematic observations of at risk sites, essential for improving



Fig. 8 - Conference participants at the dam of Zhinvali hydroelectric power station on the Aragvi River (Photo by I. Kargapolova)

mitigation measures, and by effective modelling of phenomena, necessary for forecasting and early warning systems design.

The success of the Conference ensured that the Conference will be reconvened in Tagikistan in 2020 on a date to be shortly announced.

The Proceedings of 5th conference on “Debris Flows:

Disasters, Risk, Forecast, Protection” are published by the Universal Publishing House, Tblisi; Eds. S.S. Chernomorets and G.V. Gavardashvili; ISBN: 978-9941-26-283-8 (http://www.debrisflow.ru/wp-content/uploads/2018/10/DF18_Proceedings.pdf). They are published also as a collection of papers in two issues of the Russia Georisk Journal (No. 3, 2018).