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TC221 Tailings and mine waste – Brief report

TC221 Résidus et déchets miniers – Bref rapporten

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ABSTRACT: Tailings dams and rock waste dumps are among the largest earth structures that are built these days and require specialized geotechnical engineering to ensure their physical stability. Unfortunately, catastrophic failures of tailings dams have occurred, suggesting that the current state of practice has an insufficient set of regulations, government controls, provisions and geotechnical knowledge that are necessary to address and improve. Accordingly, the TC221 has an important role to play in these issues. In this conference the liquefaction phenomenon, its evaluation, and its use in tailings dam stability, attracted an important number of articles. The consolidation phenomenon was also addressed. The proposals for early warning systems show the use of new technologies in geotechnics. The challenge of characterizing waste rock materials is well addressed in the articles presented. Other important topics such as risk analysis, numerical modeling, filter criteria, liners permeability, arsenic attenuation, strength anisotropy, seasonal weathering, alkalic activation, delayed response time of standpipes piezometers, were also presented.

RÉSUMÉ : Les digues à résidus et les décharges de déchets rocheux comptent parmi les plus grandes structures en terre construites de nos jours et nécessitent une ingénierie géotechnique spécialisée pour assurer leur stabilité physique. Malheureusement, des défaillances catastrophiques de barrages de résidus se sont produites, ce qui suggère que l'état actuel de la pratique comporte un ensemble insuffisant de réglementations, de contrôles gouvernementaux, de dispositions et de connaissances géotechniques nécessaires pour traiter et améliorer. En conséquence, le TC221 a un rôle important à jouer sur ces questions. Dans cette conférence, le phénomène de liquéfaction, son évaluation et son utilisation dans la stabilité des digues à stériles, ont attiré un nombre important d'articles. Le phénomène de consolidation a également été abordé. Les propositions de systèmes d'alerte précoce montrent l'utilisation des nouvelles technologies en géotechnique. Le défi de caractériser les matériaux de stériles est bien abordé dans les articles présentés. D'autres sujets importants tels que l'analyse des risques, la modélisation numérique, les critères de filtrage, la perméabilité des revêtements, l'atténuation de l'arsenic, l'anisotropie de résistance, l'altération saisonnière, l'activation alcaline, le temps de réponse différé des piézomètres des bornes-fontaines, ont également été présentés.

KEYWORDS: Tailings, Mine waste, liquefaction, rock dump, mines.

1 INTRODUCTION.

Since the TC221 officially started in March 2021, it was not initially considered in the call for papers. Only in the final phase of paper submission, the inclusion of TC221 in the conference was decided in agreement with other TCs, which had received contributions related to tailings and mine waste. In total, 17 papers were accepted for publication. It is worth noting that several articles related to TC 221 remained in the original TCs or were sent to other sessions.

TC221 on Tailings and Mine Waste began its activities a few months after the start of the pandemic. Due to this situation, so far only online activities have been carried out, this Conference being the first opportunity for hybrid participation.

The technical presentations associated with TC221, as well as that of other TCs, were divided into two sessions: in-person and virtual.

In the format of parallel sessions, on Thursday 5, in Meeting Room C4.5, the in-person session was held from 8:30 to 9:30. The Chairman of this session was Dr. Ramón Verdugo from Chile.

Also, in the format of parallel sessions, on Thursday 5th, the virtual session was held from 09:45 to 10:45. The Chairman of this session was Prof. Roberto Cudmani from Germany.

Most of the presentations had interesting questions and discussions with good interaction between speaker and attendees. Regrettably, due to time constraints the discussions had to be interrupted.

2 PRESENTATIONS

The speakers and technical papers assigned to the in-person session were the following:

- Research results on soil liquefaction of mine dumps in Eastern Germany
  Prof Wolfram Kudla
- A review of liquefaction potential assessment in engineering practice
  Mr Yashay Narainsamy
- Liquefaction of mine dumps in Eastern Germany - new findings after a five-year monitoring research project
  Dr Tino Rosenzweig
- Flow liquefaction triggering analyses of a tailings storage facility by means of a simplified numerical procedure
  Mauro Sottile
- The concept of static liquefaction and its application in stability analysis of tailings dams
  Dr. Ramon Verdugo

The speakers and technical papers of virtual session were the following:

- The implications of transitional behaviour for tailings
  Prof Matthew Coop

- Towards sustainable and safe tailings dams
  Dr Luca Piciullo

- Natural weathering as a surface crusting tool for tailings management
  Ms. Umme Rima

- Shear strength estimation of very coarse mine waste using Barton's empirical criterion and a Bayesian analysis
  Ms. Sandra Linero Molina

3 GENERAL REPORT

The liquefaction phenomenon, its evaluation, and its effect on the stability of tailings dams attracted the interest of the many participants and resulted in a significant number of contributions. A contribution dealt with the spontaneous soil liquefaction events occurring in the dumps of former open-pit lignite mines in Lusatia, Germany. The consolidation of the slimes in TSFs was also in the focus of the contributions. Proposals for early warning systems show the potential of new monitoring technologies in geotechnics. The challenge of characterizing waste rock materials was also addressed in the TC sessions.

Other important topics such as risk analysis, numerical modeling, filter criteria, liners permeability, arsenic attenuation, strength anisotropy, seasonal weathering, alkalic activation, delayed response time of standpipes piezometers, were also discussed in the sessions.

This variety of topics allows us to conclude that the geotechnics associated with tailings and mine waste is extraordinarily broad, probably requiring a sub-specialization in mining geotechnics.

4 ACKNOWLEDGMENTS

The 20th ICSMGE held in Sydney was one of the first in-person events since the begin of the pandemic restrictions in 2020. This undoubtedly meant an additional effort for the organizers, who managed to successfully carry out this event. On behalf of TC221, we want to express our gratitude to the organizers for everything they have done.