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Helder I. Chaminé
Editors

Advances in Natural Hazards and Hydrological Risks: Meeting the Challenge

Proceedings of the 2nd International Workshop on Natural Hazards (NATHAZ'19), Pico Island—Azores 2019

Springer

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Foreword by José Virgílio Cruz

This special volume of the *Advances in Science, Technology & Innovation* series introduces a set of proceedings that draw on natural hazards and hydrological risks, selected from communications presented at the 2nd International Workshop on Natural Hazards (NATHAZ'19) that took place in Pico Island (Azores, Portugal).

The specific location of the conference, in one of the nine islands from the Azores, a volcanic archipelago with a complex geodynamic setting which explains the ongoing seismo-volcanic activity, historically described since the settlement in the fifteenth century, provided a perfect scenery for the meeting. In fact, addressing hazards in islands such as Pico, where a set of natural hazards have been described, from volcanic eruptions and earthquakes to flash floods, landslides, coastal erosion and aquifer salinization processes, supply several good examples of the interaction between natural hazards and society. It is noted that, besides the island being relatively small and having a low population, Pico attracts an increasing number of tourists to their environmentally fragile territory, increasing vulnerability to natural hazards.

Furthermore, climate change scenarios suggest that in the Azores the annual precipitation will be higher and rainy events will be more concentrated over time during winter, while in summer drier conditions will be intensified. Thus, the emergence of these climatic conditions poses new challenges in the forthcoming future, as a higher number of flash floods events are to be expected, favoured by the hydrological and geomorphological characteristics associated to much more intense precipitation. Several other examples could also be drawn from the climate change implications to natural hazards in islands, such as, among others, coastal erosion or groundwater salinization.

The volume offers a vivid overview of the current research being made worldwide on natural hazards, a subject with societal impacts of great importance. The set of proceedings presented reflect a multidisciplinary approach to the workshop subject, comprising more than thirty proceedings authored by researchers from several countries.

A first chapter presents several studies on hydrological hazards, including their relationship with hydrogeomorphology, landslides and geochemical processes in aquifers, namely groundwater contamination. A second chapter addresses hazard assessment and the water role, mainly focused on slope instability, landslides and rockfalls. Nevertheless, these proceedings also include studies on other natural hazards, such as subsidence and forest fires, as well as their relationship with land use planning and climate change impacts. A third chapter contributes with several case studies of flood events and coastal processes, as well as engineering approaches to natural hazards characterization and adaptation measures. Finally, the last chapter includes an interesting guide related to the field trip.

The overall high quality of the proceedings highlights the importance of the present volume that will be a cornerstone in what regards natural hazards research and the application of their findings towards vulnerability reduction and to civil protection enhancement. Thus, students, researchers and practitioners from several fields, from the earth and environmental sciences to engineering, will find the present volume of interest and a useful companion in their bookshelf.

June 2019

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Foreword by Nabil Khélifi

Awareness of the need to incorporate disaster risk reduction and preparedness programmes into strategies and plans for sustainable development is increasing. These programmes include risk reduction, hazard mitigation and the lessening of vulnerability as we adapt to climate change. In the 17 UN Sustainable Development Goals (SDGs) outlined in the UN 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction 2015–2030, disaster risk reduction and resilience are high priorities. In 10 of these SDGs, 25 targets establish disaster risk reduction as a core development strategy involving many different sectors of development.

The scientific community has stepped up its research efforts on how to reduce the risks associated with disasters, how to build resilience in future and how to achieve the goals and targets set by both the Sendai Framework and the 2030 Agenda for Sustainable Development. In the latter, the scientific community recognizes and reaffirms the urgent need to reduce disaster risk through enhanced research activities and collaborations. These actions encourage and endorse increased political commitment and economic investment to reduce risks and take development initiatives in which disaster resilience is seen as fundamental to poverty reduction and as a key dimension of sustainable development.

Inspired by the UN's SDGs, Springer Nature's Grand Challenges Programme was launched in 2017 with an initial focus on five global challenges: climate change; global health; the food–energy–water nexus; a digitally transformed world; and sustainable cities. Now in its second year, the programme supports cutting-edge research in a wide range of disciplines, including science, engineering, social sciences and humanities. It helps practitioners to develop innovative and effective policies, programmes and technologies addressing global issues by connecting them with the latest evidence-based research. The programme has inspired collective action throughout Springer Nature and beyond. From new publishing strategies to initiatives connecting academic, business and policy leaders, this programme is part of a broad, concerted effort to tackle major social, environmental and economic challenges.

In Springer, we are inspired by and want to support the Sustainable Development Goals through Springer Nature. Several of our Springer Nature Grand Challenges speak specifically to these goals and we are working to bring our strength and expertise to those areas for the benefit of our planet and mankind. Publishing research work in this field is one of the ways we seek to complement existing regional and global actions to reduce the risk of disasters and our vulnerability to them.

This edited volume published by Springer is an important piece of scientific work which informs the efforts to reduce disaster risk and to build resilience as we strive to achieve sustainable development. It highlights the importance of undertaking hazard and risk assessment studies so that hazard mitigation can be achieved. Several case studies in this volume provide ideal examples of how the scientific research community can contribute to a more sustainable and safer environment by improving our understanding of natural hazards and how a "design with nature" concept can be followed to ensure that the way we occupy and modify the Earth is planned and designed to be compatible with nature, the environment and society.

I would like to thank the editors of this volume and the authors of the chapters, who participated in the 2nd International Workshop on Natural Hazards (NATHAZ'19), for their confidence by publishing the results of their work in this volume by Springer, the leading global publisher of academic books!

Heidelberg, Germany
June 2019

Nabil Khélifi
Senior Publishing Editor

Preface

Pico Mountain, with black clouds covering its tower and coming down the whole slope which finally looks out over the heights of Friar Matias' Cave…
Carlos Faria (Kinsella 2007)

Natural hazards are the consequence of a threat of a naturally occurring event will have a harmful outcome on persons and ecosystems. That damaging effect is often called natural disasters. That is defined by the UN—United Nations (IASC 2006) as: "the consequences of events triggered by natural hazards that overwhelm local response capacity and seriously affect the social and economic development of a region". UN (IASC 2006; Report of the Secretary General to the General Assembly 2005) highlights also the key challenges faced by international community as: "The risks and potential for disasters associated with natural hazards are largely shaped by the prevailing levels of vulnerability and the effectiveness of measures taken to prevent, mitigate and prepare for disasters". For all that the shared comprehensive knowledge is the key to understand the functioning of natural systems within climate change framework and outline guidelines and measures based on sustainable environments, socio-responsibility and ethical approach to achieve balanced and integrated management. In addition, as recently stated by the UN—United Nations (IPCC 2019; Intergovernmental Panel on Climate Change) "knowledge on risk is essential for conceiving and implementing adequate responses".

Among the natural hazards and potential disasters to be considered are earthquakes, volcanic eruptions, landslides, rockfalls, subsidence, floods, droughts and coastal erosion. In addition, anthropogenic hazards occur as a result of human interaction with the environment. They comprise technological hazards, which occur due to exposure to hazardous substances in the environment. Natural systems in different framework require a comprehensive understanding of climatology, geology and hydrology data and dynamics. Thus, it is important to perform hazard and risk assessment studies to accomplish hazard mitigation. Currently, it is vital to highlight the role of the variability and climate change in natural systems. Furthermore, an accurate understanding of the natural systems and interactions with engineering and natural resources has a vital significance to the entire socio-economic sector. That is the key landmark to achieve in any natural hazards project aiming at a sustainable design that is compatible with nature, environment and society (McHarg 1992; González de Vallejo 2010).

This volume offers an overview related to natural hazards in model regions in Asia, Europe, America and Atlantic islands. It gives new insights on characterization, assessment, protection, modelling on geological hazards, water systems, urban areas, coastal zones and engineering approaches by international researchers and professionals. Furthermore, the volume gives a general overview of current research and challenges focusing on natural hazard issues and its applications to a variety of problems worldwide but highlighting volcanic islands framework.

The volcanic origin of the Azores islands, associated with the geographic location, its archipelagic nature (nine dispersed and distant islands in Atlantic Ocean often subject to adverse weather conditions) and its geodynamic framework, make Azores highly vulnerable to

natural hazards (Malheiro 2006; Malheiro and Nunes 2007; Malheiro et al. 2016; Kueppers and Beier 2018). Pico is the biggest island of the Central Azorean Group and shows the highest point of Portugal (2351 m), the Pico Mountain volcano, which is the third highest volcano of the North Atlantic Ocean (Kueppers and Beier 2018). In addition, the Azores archipelago is affected by most of the all-natural hazards, namely earthquakes, volcanic eruptions, landslides, floods, coastal erosion, damages in engineering works, etc. Some of these events have resulted in heavy damage to people and goods. Consequently, it was the perfect place where experts in these fields discussed and shared several case studies and vision aiming the advance of the natural hazard's knowledge. The workshop highlighted all aspects of natural hazards focusing in hydrological hazards and risks, including the forecasting of catastrophic events, risk assessment and management, as well as all aspects of water resources impacts, and oceanic, natural and technological hazards and disasters because all that it is extremely important the sharing of the results of 2nd International Workshop on Natural Hazards (NATHAZ'19) in an archipelago marked by natural hazards and, for that reason, with a strong geodynamic context that drives us to know more. In a sense, Azores is a real natural laboratory at the centre of the Atlantic, opened to the exchange of knowledge and experiences that enrich and prepare the region for a correct societal perception and a balance sustainable environmental practice. That approach will be another pillar of Azores socio-economic and more sustainable autonomous region within the European Union context. In fact, the impressive words of the outstanding Azorean writer, Vitorino Nemésio, are still topical: "For us, geography is just as important as history, and it is not without reason that 50% of our written memories comprise records of earthquakes and floods". (Nemésio 1932).

This book comprises the select proceedings during the 2nd International Workshop on Natural Hazards (NATHAZ'19), Lajes do Pico, Pico Island, Azores 2019. The challenges of balanced management and design with natural hazards are confirmed by the diversity of contributions to this special volume (Fig. 1). Main topics include: (i) hydrological hazards, hydrogeomorphology, groundwater and disasters; (ii) hazard assessment, spatial planning and climate change; (iii) natural hazards, hydrodynamics and engineering design; and (iv) around of Pico Island geology: meeting natural hazards.

The special volume has a core of 32 original proceedings grounded on the scientific-technical sessions (including the unforgettable field trip coordinated by João Carlos Nunes from University of Azores and INOVA) and three outstanding keynote lectures by leading experts, José Luís Zêzere (University of Lisbon, Portugal), Luís Ribeiro e Sousa (University of Tongji, China) and Giuseppe Sappa (La Sapienza University of Rome, Italy). The keynote speakers gave interesting insights from hydrological hazards focused on hydrogeomorphology and disasters, geotechnical hazards highlighting the role of water, as well as landslide risks and flooding hazards and hydraulic design. The volume gathered over 115 authors from the academy, research centres and/or state laboratories from Europe, Africa, America and Asia (Figs. 2, 3, 4).

The volume will be of interest to researchers and practitioners in the field of geosciences, hydrology, groundwater, natural hazards and geotechnics, as well as those engaged in sustainable environmental sciences, earth sciences, natural resources and engineering design. Graduate students, geoscientists, engineers and natural hazard-related professionals further research in the earth and environmental sciences will also find the book to be of value.

S. Miguel do Arcanjo rock fall (São Roque do Pico, Pico island Azores), june 2014 (Malheiro et al. 2016)

Fig. 1 Word cloud based on all abstracts of the special volume on "Advances in Natural Hazards and Hydrological Risks: Meeting the Challenge" (generated using http://www.wordle.net/). The image shows the recent rockfall occurred on the coastline cliff in the place of São Miguel Arcanjo, at São Roque Municipality (Pico Island, Azores). That event has affected a municipal road, the water and electricity supply system and has caused the relocation of 31 people (9 houses). The landslide occurred on a volcanic cliff. This natural hazard event took place in four stages: (i) occurred by September 2013; (ii) and (iii) on 13 June 2014; and (iv) the last happened 3 days later, on 16 June 2014. The rockfall process culminated with a global failure of a considerable segment of the cliff (ca. 100 high and 140 m length) and has triggered a retreat of the cliff of approximately 30 m (details in Malheiro et al. (2016))

Fig. 2 Overview during the sessions from the 2nd International Workshop on Natural Hazards (NATHAZ'19), Lajes do Pico, Azores (+ info: https://sites.google.com/civil-event.pt/nathaz19/homepage): opening ceremony by the President of Organizing Committee, Francisco Fernandes (LREC) and the Mayor of Lajes do Pico municipality, Roberto Silva; keynote lectures and presentations during the event

(Image: José Macedo; Design: LREC)

Fig. 3 Overview during the sessions from the 2nd International Workshop on Natural Hazards (NATHAZ'19), Lajes do Pico, Azores: presentations; a unique musical moment performed the director of Baleeiros Museum, Manuel Costa; Ana Malheiro presenting the NATHAZ'21 dedicated to Volcanic Risks and to be held in Terceira Island, Azores, 2021; closing ceremony by Scientific Committee Chairs, Ana Malheiro (LREC) and Helder I. Chaminé (ISEP)

Fig. 4 Overview during the field trip visits from the 2nd International Workshop on Natural Hazards (NATHAZ'19), Lajes do Pico, Azores, leaded by João Carlos Nunes (University of Azores and INOVA) and supported by the LREC colleagues Ana Malheiro, Francisco Fernandes, Filipe Marques, Letícia Moniz, Paulo Amaral, Roberto Dutra and Helena Brasil

The special volume comprises case studies that demonstrate the role of natural hazards understanding can contribute to a more sustainable and safer environment, also discusses the latest advances in natural hazards from diverse backgrounds, particularly highlighting the role of the variability and climate change in hydrological systems and, lastly, offers new insights on natural hazards mapping, characterization, assessment, protection and geoethics aiming a better knowledge and design with nature.

Ponta Delgada, Azores, Portugal — Francisco Fernandes
Ponta Delgada, Azores, Portugal — Ana Malheiro
Porto, Portugal — Helder I. Chaminé
May 2019

References

González de Vallejo LI (2010) Design with geo-hazards: an integrated approach from engineering geological methods. Soils and Rocks. Int J Geot Geoenviron Eng 31(1):1–28

IASC (2006) Protecting persons affected by natural disasters. IASC Operational Guidelines on Human Rights and Natural Disasters, Washington, DC [https://www.preventionweb.net/files/1617_2006IASCNaturalDisasterGuidelines.pdf]

Kinsella JM (2007) Voices from the islands: an anthology of Azorean poetry. Gavéa-Brown Publications, Providence, Rhode Island

Kueppers U, Beier C (eds) (2018) Volcanoes of the Azores: revealing the geological secrets of the Central Northern Atlantic Islands. Springer, Berlin

Malheiro A (2006) Geological hazard in the Azores archipelago: volcanic terrain instability and human vulnerability. J Volcanol Geoth Res 156:158–171

Malheiro A, Amaral P, Marques F, Moniz L (2016) Instabilidade geomorfológica ocorrida em junho de 2014 no lugar de São Miguel Arcanjo (ilha do Pico). In Matos Fernandes M, Topa Gomes A, Couto Marques J et al (eds) Proceedings XV Congresso Nacional de Geotecnia / 8º Congresso Luso-Brasileiro de Geotecnia, FEUP, Porto, pp 1–12

Malheiro A, Nunes JC (eds) (2007) Volcanic rocks. Proceedings of the International Workshop on Volcanic Rocks, Workshop W2, 11th Congress ISRM, Ponta Delgada, Azores. Taylor & Francis Group, London, UK

McHarg IL (1992) Design with nature. 25th anniversary edition. Wiley series in sustainable design. Wiley, New York

Nemésio V (1932) Açorianidade. In Insula, Número Especial Comemorativo do V Centenário do Descobrimento dos Açores, nº 7–8, Julho-Agosto, Ponta Delgada, p 59

Report of the Secretary General to the General Assembly (2005) On international cooperation on humanitarian assistance in the field of natural disasters, from relief to development. Document A/60/227 [https://www.un.org/press/en/2005/ga10420.doc.htm]

UN—United Nations (2019) Summary for policymakers. In Pörtner HO, Roberts DC, Masson-Delmotte V et al (eds) IPCC Intergovernmental Panel on Climate Change, Special Report on the Ocean and Cryosphere in a Changing Climate. United Nations, WMO & UNEP, Washington, DC [https://www.ipcc.ch/srocc/download-report/]

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The guest editors are grateful for the continuous and the enthusiastic support of publishing staff of Springer headed by Nabil Khélifi, Senior Editor, Reyhaneh Majidi, Editorial Assistant, and Springer production team, for their efforts in completing this proceedings volume. All the above-mentioned efforts were very significant in making this book a success. The volume is included in the celebration of the 40 years old of LREC—Regional Civil Engineering Laboratory, Azores.

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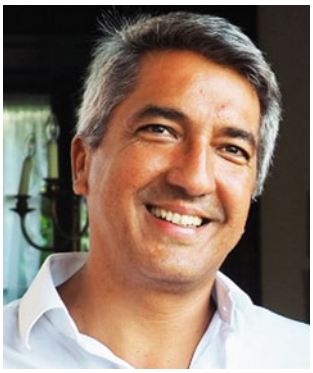

Francisco Fernandes is a skilled Civil Engineer, with over 22 years of experience in practice and research in civil engineering. After an internship at the "Sociedade de Empreitadas e Trabalhos Hidráulicos", he began his career in 1997 in budgeting and cost control at Engil. He was also a controller and responsible for several management areas at Eng. Luís Gomes company. He worked as a project manager in the Marques, Engil and Eng. Luís Gomes companies, and as director of the production.

Senior Member of the Institution of Portuguese Engineers has a master's degree in Business Administration and Management from the University of the Azores (2003), is Qualified Expert in the Energy Certification System (SCE–RCCTE), ADENE (Agency for Energy and Technical Superior of Safety and Hygiene of Work—Level 5). Other activities include participation in various courses, seminars and vocational training actions in the fields of engineering, safety and hygiene at work, energy certification and management, as a designer and qualified expert of the energy certification system.

Presently, since 2012 he is Head of the Regional Laboratory of Civil Engineering in Azores. Currently, he is a board member of the Portuguese Seismic Engineer Society (SPES) and a member of the Fiscal Council of the Fund for the Development of Construction Sciences.

As President of the Organizing Committee, he was responsible for several scientific events, namely the 10th Portuguese Congress of Seismology and Earthquake Engineering, the 16th Portuguese Geotechnical Congress, the 6th Luso-Spanish Geotechnical Conference and the 1st and 2nd International Workshop on Natural Hazards. Currently, is the chair of the organizing committee of the 3rd International Workshop on Natural Hazards (Volcanological Risks)—NATHAZ'21 (Terceira Island, Azores, May 2021).

Ana Malheiro is a skilled Geologist with 34 years of experience in practice and research in engineering geology, geotechnics and geological hazards. She studied Geology at the Faculty Sciences of the University of Lisbon in 1983 and received her master's degree at the University of Azores in Volcanology and Geological Risks in 2002.

She works since 1984 in the Regional Laboratory of Civil Engineering where she responsible for the areas of engineering geology, in situ geological and geotechnical investigations, geotechnics and geological risks. She was Head of the Division of Ports (1995/1998), and since 1998 until now, she is Director of Services of the Department of Geotechnics and Exploration. She participated in several Coordination Commissions for Management Plans (namely Regional Plans and Municipal Plans). In addition, was also invited assistant lecturer (1985/1990; 1996/1999) at Azores University.

She participated in several organizing committees for National and International Congresses and Workshops, as well as Scientific Commissions (e.g. 15th World Conference on Seismic Engineering, Lisbon, 2012; 5th, 9th and 10th National Congress of Seismology and Seismic Engineering, respectively in 2001, 2014 and 2016; 16th National Congress of Geotechnics, 2018 2nd International Workshop "Natural Hazards—Hydrological Risks"). Currently, is the chair of the scientific committee of the 3rd International Workshop on Natural Hazards (Volcanological Risks)—NATHAZ'21 (Terceira Island, Azores, May 2021).

She has been co-authored several publications in indexed journals, conference proceedings/full papers, book chapters, technical, professional papers and technical reports. She co-edited the ISRM special volume *Volcanic Rocks* (Taylor & Francis). In general, technical reports they focus on the field of in situ geological-geotechnical investigations to support the larger constructions built in the Azores region, coastal erosion, slope stability; as well as, the evaluation of resources in quarries, evaluation of geological and/or geotechnical problems and the assessment of geological hazards. She has integrated some research projects in the fields of geotechnical characterization of volcanic materials, stability of slopes, monitoring of unstable areas, etc.

Helder I. Chaminé is a skilled Geologist and Professor of Engineering Geosciences at School of Engineering (ISEP) of the Polytechnic of Porto, with over 29 years' experience in multidisciplinary geosciences research, consultancy and practice. He studied geological engineering and geology (B.Sc., 1990) at the Universities of Aveiro and Porto (Portugal), respectively. He received his Ph.D. in geology at the University of Porto in 2000 and spent his postdoctoral research in applied geosciences at the University of Aveiro (2001–2003). In 2011, he received his Habilitation (D.Sc.) in geosciences from Aveiro University.

Before joining the academy, he worked over a decade in international projects for mining, geotechnics and groundwater industry and/or academia related to geodynamics and regional geology, hard-rock hydrogeology and water resources, engineering geosciences and applied geomorphology, rock engineering and georesources. His research interests span over fundamental to applied fields: GIS mapping techniques for applied geology, structural geology and regional geology, engineering geosciences and rock engineering, slope geotechnics, mining geology and hydrogeomechanics, hard-rock hydrogeology, exploration hydrogeology, urban groundwater and hydromineral resources. He has interests in mining geoheritage, history of cartography, military geosciences and higher-education dissemination, skills and core values.

Presently, he is Head of the Laboratory of Cartography and Applied Geology (LABCARGA | ISEP), Senior Researcher at Centre GeoBioTec | U.Aveiro and Centre IDL | U.Lisbon, as well as belongs to the executive board of the M.Sc./B.Sc. Geotechnical and Geoenvironmental Engineering (OE +EUR-ACE Label) and the Department of Geotechnical Engineering (ISEP). Currently, he belongs to the board of the Portuguese Geotechnical Society (SPG) and IAH—Portuguese Chapter. He was a board member of the APGeom—Portuguese Association of Geomorphologists (2009–2013). He was a consultant and or responsible over 70 projects of rock engineering, applied geology, hydrogeomechanics, slope geotechnics, mining geology, exploration hydrogeology, hard-rock hydrogeology, water resources, urban groundwater and applied mapping (Mozambique, Portugal and Spain).

He has been co-authored over 200 publications in indexed journals, conference proceedings/full papers, book chapters, technical and professional papers. He co-edited 13 special volumes, as well as is presently evolved in editing themed issues for three international journals (Geotechnical Research ICE, Springer Nature Applied Sciences, Water MDPI). He has a wide activity as a referee for several international journals. He served as invited Expert Evaluator of Bologna Geoscience programme for DGES (Portugal) and Scientific Projects Evaluation for NCST (Kazakhstan) and NRF|RISA (South Africa), as well as Coordinator of "Geology on Summer/Ciência Viva" programme at ISEP for geosciences dissemination. He has been also active with teaching and supervising of many Ph.D., M.Sc. and undergraduate students.

He has been on the editorial board, among others, of *Arabian Journal of Geosciences* (SSG+Springer), *Hydrogeology Journal* (IAH+Springer), *Geotechnical Research ICE* (UK), *Springer Nature Applied Sciences* (Springer), *Mediterranean*

Geoscience Reviews (Springer), *Geosciences MDPI*, *Revista Geotecnia* (Portugal/Brazil/Spain) and *Geología Aplicada a la Ingeniería y al Ambiente* (Argentina). Currently, is co-chair of the International Conference "Geoethics and Groundwater Management" (IAH+IAPG, Porto, May 2020) and in scientific committee of the 3rd International Workshop on Natural Hazards—NATHAZ'21 (Terceira Island, Azores, May 2021).