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Pedro Lima · Alejandra J. Donato · Maria I. Arango · Martin Mergili · Robert Kanta · Thomas Glade

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Mobility, Hazard, and Risk Analysis of Selected Landslides in Lower Austria

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Foreword

In this book, the authors present an exploration of landslide run-out scenarios and related risks in Lower Austria's Behamberg, Erla, and Kreisbach areas. The analysis through various models ranging from conservative to catastrophic settings illustrates the complexities of landslide dynamics and their profound implications.

It's crucial to remember George Box's words: '*All models are wrong, but some are useful.*' This sentiment echoes throughout the book, reminding us of the utility of models as tools for understanding and preparation, rather than absolute predictors of natural events—in this case related to landslides.

This book links an academic study with practical needs and concerns; it is a call to understand our ever-changing landscape and the potential impacts of respective natural processes, explored for landslides and their impacts. It's an invaluable resource for anyone involved in environmental management, urban planning, or disaster risk mitigation.

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Preface

In this comprehensive exploration of landslide run-out behavior, the book meticulously crafts a range of run-out scenarios based on the potential extent of individual landslide failures. Within each of these scenarios, two distinct sub-scenarios are modeled to reflect the bandwidth nature of landslide dynamics. These sub-scenarios, labeled as 'rather viscous' and 'rather fluid,' simulate different responses of the landslide material, ranging from more solid, slow-moving creep and flow to more fluid, rapid movements. The different material conditions are crucial in understanding how triggering mechanisms, like rainfall, might influence the behavior of landslide movement and consequent impacts on the environment as well as the exposed elements at risk. These applied modeling approaches, encompassing numerous scenarios, provide a nuanced understanding of landslide dynamics under different conditions, thereby contributing to the understanding of landslide dynamics and assessing environmental risk in order to develop appropriate management strategies.

Before delving further into the book, it is essential to clarify the naming conventions used throughout this text to describe the various models. Each of the three study sites explored has varying numbers of scenarios, with two sites having three scenarios each (Erla and Kreisbach), and one site having five scenarios (Behamberg). Each scenario is examined under two conditions: a 'rather fluid' (RF) and a 'rather viscous' (RV) state. For example, 'S1RF' refers to 'Scenario 1, rather fluid,' indicating a model that simulates a more liquid behavior of the landslide, whereas 'S2RV' denotes 'Scenario 2, rather viscous,' representing a more solid, slow-moving flow. This distinction is pivotal for the reader's understanding of the analyses and results presented in this book.

The respective models have been applied to three specific study sites located in Lower Austria, Austria. These study sites include Behamberg, Erla, and Kreisbach, each presenting unique geographical and environmental conditions that contribute to the complexity of landslide behavior. For each site, a range of scenarios is explored, depending on the expected extension of each potential landslide failure. Within these scenarios, the previously described two sub-scenarios (rather fluid and rather viscous) are applied to model different potential landslide behaviors. This regional focus not only sheds light on the specific challenges faced by Lower Austria but also offers

universal lessons applicable to similar environments elsewhere, be it other sites in Lower Austria, or in other Austrian regions, or even in Europe or globally.

This book aims to raise awareness of the dynamic and potentially volatile nature of our environment. It seeks to illustrate how landscapes can evolve in nearly unpredictable ways, leading to various consequences which have not been reported yet. The collection of studies within these pages attempts to forecast these changes and their impacts, providing a valuable resource for policymakers, environmentalists, and anyone involved in disaster risk management and mitigation. Therefore, this book sheds light on the currently unknown—but possible—landslide dynamics including selected consequences. This work serves as a testament to the complexity of natural phenomena and its consequences. There is a continuous effort needed to understand and adapt to these challenges.

These aims are treated within five book chapters:

Chapter 1—Introduction: This chapter sets the background and motivation for the study, outlining the objectives and foundational concepts that guide the subsequent chapters. It provides a comprehensive introduction to the key themes and research areas that will be explored in detail throughout the book.

Chapter 2—Methodology: This chapter details the methodological framework of the study, including data collection and processing, creation of modeled scenarios, and risk analysis. It explains the systematic approach used to gather and analyze data, and how this information contributes to the understanding of the study's main themes.

Chapter 3—Study Areas: This chapter focuses on the specific study sites, Erla, Behamberg, and Kreisbach. It offers a general characterization of each area and discusses the construction of scenarios relevant to the study's objectives. This chapter is crucial for understanding the practical applications of the research in real-world settings.

Chapter 4—Results: This chapter presents the findings from the study, including the economic consequences associated with different landslide scenarios in all study areas. It is a critical chapter that interprets the data collected and analyzed in the previous chapters, providing insights, and conclusions based on the research outcomes.

Chapter 5—Discussion and Perspectives: This final chapter discusses the implications of the study's findings, considering different hazard levels and offering recommendations for future research and practice. It serves as a reflective analysis of the entire study, linking back to the initial objectives, and providing a forward-looking perspective.

The authors hope that this book contributes to a more advanced understanding of what might happen in the future with respect to landslide run-out behavior, and what

some of the potential consequences might be. It might be used as a guiding reference for further explorations.

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