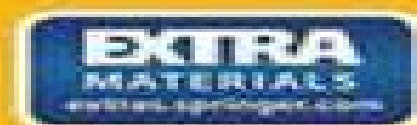


Advances in Natural and Technological Hazards Research

# Submarine Mass Movements and Their Consequences

Jacques Locat and Jürgen Mienert (Editors)

SPRINGER SCIENCE+BUSINESS MEDIA



# Submarine Mass Movements And Their Consequences First International Symposium

**Lei Huang**



## **Submarine Mass Movements And Their Consequences First International Symposium:**

**Submarine Mass Movements and Their Consequences** Jacques Locat, Jürgen Mienert, 2012-12-06 Did you know that the Grand Bank earthquake of 1929 triggered a huge submarine mass movement which broke submarine cables over a distance of up to 1000 km from its source and generated a tsunami which devastated a small village in Newfoundland killing 27 people The same happened in Papua New Guinea in 1998 with more than 2000 casualties Submarine mass movements of various sizes and styles are shaping the sea floor and are of concern for many facets of human activities both onshore and offshore These include the development of natural resources energy and communication transport coastal infrastructures and communities This book provides a world wide perspective of submarine mass movements and their consequences This has been made possible by assembling excellent contributions from active researchers groups or institutions thus providing full coverage of the many scientific and engineering aspects of this type of marine and coastal geo hazard It covers fundamental as well as site specific studies from many areas including the Atlantic and Pacific oceans inner seas like the Mediterranean Sea and fjords using the most recent technologies from multibeam sonar imaging techniques 3D seismic analysis slope stability analysis to debris flow and tsunami modeling Audience This book is of interest to any researcher in the field of marine and coastal geo hazards It will be useful for planners scientists and engineers involved in the development of offshore and near shore resources and also to those in charge of the management and mitigation of coastal hazards For graduate students this book provides an up to date vision of the process of submarine mass movements and their consequences from both a scientific and an engineering standpoint and it includes a unique collection of the existing literature on marine geo hazards CD Rom included This volume contains a CD Rom which in addition to an electronically searchable version of the contributions has full colour versions of figures which are printed in black and white in the book

**Submarine Mass Movements and Their Consequences** Vasilios Lykousis, Dimitris Sakellariou, Jacques Locat, 2007-09-14 With contributions from leading researchers in science and engineering this book provides a global perspective on submarine mass movements and their consequences Authors report on new findings from fundamental as well as site specific studies from around the world All studies relied on the most recent technologies including multi beam sonar imaging techniques 3D seismic analysis slope stability analysis debris flow and tsunami modeling *Mass Transport, Gravity Flows, and Bottom Currents* G. Shanmugam, 2020-10-31 *Mass Transport Gravity Flows and Bottom Currents* Downslope and Alongslope Processes and Deposits focuses solely on important downslope and alongslope processes The book provides clear definitions and characteristics based on soil mechanics fluid mechanics and sediment concentration by volume It addresses Slides Slumps and Debris Flows Grain Flows Liquefied Fluidized Flows and Turbidity Currents Density plumes Hyperpycnal Flows the Triggering Mechanisms of Downslope Processes Bottom Currents and Soft Sediment Deformation Structures The mechanics of each process are described in detail and used to provide empirically driven categories to help recognize these

deposits in the rock record Case studies clearly illustrate of the problems inherent in recognizing these processes in the rock record and potential solutions are provided alongside future avenues of research An appendix also provides step by step guidance in describing and interpreting sediments Comprehensively addresses modern downslope and alongslope processes including definitions and mechanisms Provides key criteria for the recognition of depositional facies in the rock record Includes case studies to illustrate each downslope and alongslope process Identifies key problems and potential solutions for future research Uses pragmatic empirical data driven interpretations to revise conventional facies models Submarine Mass Movements and their Consequences Geoffroy Lamarche,Joshu Mountjoy,Suzanne Bull,Tom Hubble,Sebastian Krastel,Emily Lane,Aaron Micallef,Lorena Moscardelli,Christof Mueller,Ingo Pecher,Susanne Woelz,2015-10-02 This book is a comprehensive collection of state of the art studies of seafloor slope instability and their societal implications The volume captures the most recent and exciting scientific progress made in this research field As the world's climate and energy needs change the conditions under which slope instability occurs and needs to be considered are also changing The science and engineering of submarine or more widely subaqueous mass movements is greatly benefiting from advances in seafloor and sub seafloor surveying technologies Ultra high resolution seafloor mapping and 3D seismic reflection cubes are becoming commonly available datasets that are dramatically increasing our knowledge of the mechanisms and controls of subaqueous slope failure Monitoring of slope deformation repeat surveying and deep drilling on the other hand are emerging as important new techniques for understanding the temporal scales of slope instability In essence rapid advances in technology are being readily incorporated into scientific research and as a result our understanding of submarine mass movements is increasing at a very fast rate The volume also marks the beginning of the third IGCP project for the submarine mass movement research community IGCP 640 S4SLIDE Significance of Modern and Ancient Submarine Slope LandSLIDEs The Submarine Mass Movements and Their Consequences symposium is the biannual meeting under the IGCP umbrella

*Submarine Mass Movements and Their Consequences* Yasuhiro Yamada,Kiichiro Kawamura,Ken Ikehara,Yujiro Ogawa,Roger Urgeles,David Mosher,Jason Chaytor,Michael Strasser,2011-10-13 Submarine mass movements represent major offshore geohazards due to their destructive and tsunami generation potential This potential poses a threat to human life as well as to coastal nearshore and offshore engineering structures Recent examples of catastrophic submarine landslide events that affected human populations including tsunamis are numerous e.g. Nice airport in 1979 Papua New Guinea in 1998 Stromboli in 2002 Finneidfjord in 1996 and the 2006 and 2009 failures in the submarine cable network around Taiwan The Great East Japan Earthquake in March 2011 also generated submarine landslides that may have amplified effects of the devastating tsunami Given that 30% of the World's population live within 60 km of the coast the hazard posed by submarine landslides is expected to grow as global sea level rises This elevated awareness of the need for better understanding of submarine landslides is coupled with great advances in submarine mapping sampling and monitoring technologies

Laboratory analogue and numerical modeling capabilities have also developed significantly of late Multibeam sonar 3D seismic reflection and remote and autonomous underwater vehicle technologies provide hitherto unparalleled imagery of the geology beneath the oceans permitting investigation of submarine landslide deposits in great detail Increased and new access to drilling coring in situ measurements and monitoring devices allows for ground truth of geophysical data and provides access to samples for geotechnical laboratory experiments and information on in situ strength and effective stress conditions of underwater slopes susceptible to fail Great advances in numerical simulation techniques of submarine landslide kinematics and tsunami propagation particularly since the 2004 Sumatra tsunami have also lead to increased understanding and predictability of submarine landslide consequences This volume consists of the latest scientific research by international experts in geological geophysical engineering and environmental aspects of submarine mass failure focused on understanding the full spectrum of challenges presented by submarine mass movements and their consequences

Proceedings of the 4th International Conference on Performance Based Design in Earthquake Geotechnical Engineering (Beijing 2022) Lanmin Wang,Jian-Min Zhang,Rui Wang,2022-09-19 The 4th International Conference on Performance based Design in Earthquake Geotechnical Engineering PBD IV is held in Beijing China The PBD IV Conference is organized under the auspices of the International Society of Soil Mechanics and Geotechnical Engineering Technical Committee TC203 on Earthquake Geotechnical Engineering and Associated Problems ISSMGE TC203 The PBD I PBD II and PBD III events in Japan 2009 Italy 2012 and Canada 2017 respectively were highly successful events for the international earthquake geotechnical engineering community The PBD events have been excellent companions to the International Conference on Earthquake Geotechnical Engineering ICEGE series that TC203 has held in Japan 1995 Portugal 1999 USA 2004 Greece 2007 Chile 2011 New Zealand 2015 and Italy 2019 The goal of PBD IV is to provide an open forum for delegates to interact with their international colleagues and advance performance based design research and practices for earthquake geotechnical engineering

**Submarine Mass Movements and Their Consequences** Sebastian Krastel,Jan-Hinrich Behrmann,David Völker,Michael Stipp,Christian Berndt,Roger Urgeles,Jason Chaytor,Katrin Huhn,Michael Strasser,Carl Bonnevie Harbitz,2013-09-02 Submarine mass movements are a hidden geohazard with large destructive potential for submarine installations and coastal areas This hazard and associated risk is growing in proportion with increasing population of coastal urban agglomerations industrial infrastructure and coastal tourism Also the intensified use of the seafloor for natural resource production and deep sea cables constitutes an increasing risk Submarine slides may alter the coastline and bear a high tsunamogenic potential There is a potential link of submarine mass wasting with climate change as submarine landslides can uncover and release large amounts greenhouse gases mainly methane that are now stored in marine sediments The factors that govern the stability of submarine slopes against failure the processes that lead to slope collapses and the collapse processes by themselves need to be better understood in order to foresee and prepare society for potentially

hazardous events This book volume consists of a collection of cutting edge scientific research by international experts in the field covering geological geophysical engineering and environmental aspects of submarine slope failures The focus is on understanding the full spectrum of challenges presented by this major coastal and offshore geohazard Landslides in Sensitive Clays Jean-Sébastien L'Heureux,Ariane Locat,Serge Leroueil,Denis Demers,Jacques Locat,2013-09-17 Landslides in sensitive clays represent a major hazard in the northern countries of the world such as Canada Finland Norway Russia Sweden and in the US state of Alaska Past and recent examples of catastrophic landslides at e g Saint Jean Vianney in 1971 Rissa in 1979 Finneidfjord in 1996 and Kattmarka in 2009 have illustrated the great mobility of the remolded sensitive clays and their hazardous retrogressive potential These events call for a better understanding of landslide in sensitive clay terrain to assist authorities with state of the art hazard assessment methods risk management schemes mitigation measures and planning During the last decades the elevated awareness regarding slope movement in sensitive clays has led to major advances in mapping techniques and development of highly sophisticated geotechnical and geophysical investigation tools Great advances in numerical techniques dealing with progressive failure and landslide kinematic have also lead to increase understanding and predictability of landslides in sensitive clays and their consequences This volume consists of the latest scientific research by international experts dealing with geological geotechnical and geophysical aspects of slope failure in sensitive clays and focuses on understanding the full spectrum of challenges presented by landslides in such brittle materials

**Earth Science in the Urban Ocean** Homa J. Lee,William R. Normark,2009 Section 1 deals with surficial seafloor mapping and characterization Sections 2 and 3 deal with fundamental geologic and oceanographic processes that introduce transport and deposit sediment particles and contaminants in the Southern California Bight T *Submarine Mass Movements and Their Consequences* D.C. Mosher,Craig Shipp,Lorena Moscardelli,Jason Chaytor,Chris Baxter,Homa Lee,Roger Urgeles,2009-10-27 Recent global events such as the devastating 1998 Papua New Guinea tsunami the 2004 Sumatran tsunami and the 2006 SE Asia undersea network cable failure underscore the societal and economic effects of submarine mass movements These events call upon the scientific community to understand submarine mass movement processes and consequences to assist in hazard assessment mitigation and planning Additionally submarine mass movements are beginning to be recognized as prevalent in continental margin geologic sections As such they represent a significant if not dominant role in margin sedimentary processes They also represent a potential hazard to hydrocarbon exploration and development but also represent exploration indicators and targets This volume consists of a collection of the latest scientific research by international experts in geological geophysical engineering and environment aspects of submarine mass failures focussed on understanding the full spectrum of challenges presented by submarine mass movements and their consequences

**Submarine Landslides** Kei Ogata,Andrea Festa,Gian Andrea Pini,2019-11-20 An examination of ancient and contemporary submarine landslides and their impact Landslides are common in every subaqueous geodynamic context from

passive and active continental margins to oceanic and continental intraplate settings They pose significant threats to both offshore and coastal areas due to their frequency dimensions and terminal velocity capacity to travel great distances and ability to generate potentially destructive tsunamis Submarine Landslides Subaqueous Mass Transport Deposits from Outcrops to Seismic Profiles examines the mechanisms characteristics and impacts of submarine landslides Volume highlights include Use of different methodological approaches from geophysics to field based geology Data on submarine landslide deposits at various scales Worldwide collection of case studies from on and off shore Potential risks to human society and infrastructure Impacts on the hydrosphere atmosphere and lithosphere **Norsk Geologisk Tidsskrift** ,2006

**Subaqueous Mass Movements and Their Consequences** A. Georgiopoulou,L.A. Amy,S. Benetti,J.D Chaytor,M.A. Clare,D. Gamboa,P.D.W. Haughton,J. Moernaut,J.J. Mountjoy,2020-07-08 This GSL volume focuses on underwater or subaqueous landslides with the overarching goal of understanding how they affect society and the environment The new research presented here is the result of significant advances made over recent years in directly monitoring submarine landslides in standardising global datasets for quantitative analysis constructing a global database and leading international research projects This volume demonstrates the breadth of investigation taking place into subaqueous landslides and shows that while events like the recent ones in the Indonesian archipelago can be devastating they are at the smaller end of what the Earth has experienced in the past Understanding the spectrum of subaqueous landslide processes and therefore the potential societal impact requires research across all spatial and temporal scales This volume delivers a compilation of state of the art papers covering topics from regional landslide databases to advanced techniques for in situ measurements to numerical modelling of processes and hazards *Mass-transport Deposits in Deepwater Settings* R. Craig Shipp,Paul Weimer,Henry W. Posamentier,2011 Historically submarine mass failures or mass transport deposits have been a focus of increasingly intense investigation by academic institutions particularly during the last decade though they received much less attention by geoscientists in the energy industry With recent interest in expanding petroleum exploration and production into deeper water depths globally and more widespread availability of high quality data sets mass transport deposits are now recognized as a major component of most deep water settings This recognition has lead to the realization that many aspects of these deposits are still unknown or poorly understood This volume contains twenty three papers that address a number of topics critical to further understanding mass transport deposits These topics include general overviews of these deposits depositional settings on the seafloor and in the near subsurface interval geohazard concerns descriptive outcrops integrated outcrop and seismic data seismic forward modeling petroleum reservoirs and case studies on several associated topics This volume will appeal to a broad cross section of geoscientists and geotechnical engineers who are interested in this rapidly expanding field The selection of papers in this volume reflects a growing trend towards a more diverse blend of disciplines and topics covered in the study of mass transport deposits *Cone Penetration Testing 2018* Michael A. Hicks,Federico

Pisanò, Joek Peuchen, 2018-06-13 Cone Penetration Testing 2018 contains the proceedings of the 4th International Symposium on Cone Penetration Testing CPT 18 Delft The Netherlands 21 22 June 2018 and presents the latest developments relating to the use of cone penetration testing in geotechnical engineering It focuses on the solution of geotechnical challenges using the cone penetration test CPT CPT add on measurements and companion in situ penetration tools such as full flow and free fall penetrometers with an emphasis on practical experience and application of research findings The peer reviewed papers have been authored by academics researchers and practitioners from many countries worldwide and cover numerous important aspects ranging from the development of innovative theoretical and numerical methods of interpretation to real field applications This is an Open Access ebook and can be found on [www.taylorfrancis.com](http://www.taylorfrancis.com)

*Historical Earthquakes, Tsunamis and Archaeology in the Iberian Peninsula* Manuel Álvarez-Martí-Aguilar, Francisco Machuca Prieto, 2022-06-22 Research on historical earthquakes and tsunamis in the Iberian Peninsula has made great strides in recent years from diverse scientific fields ranging from geology to archaeology In addition to the famous earthquake and tsunami of 1755 which intensely affected the peninsula researchers are conducting a growing number of surveys and case studies on seismic episodes and extreme wave events of possible tsunamigenic origin in Portugal and Spain during the ancient medieval and modern eras However the development of these studies has suffered due to a certain lack of communication among the different fields of research which are focused on their own methodologies and interests The aim of this book is to promote interdisciplinary dialogue by linking the results of the most recent research into historical earthquakes and tsunamis in Iberia from the fields of geology history and archaeology The volume which devotes special attention to tsunamis and to events that occurred in the Iberian Peninsula before 1755 offers synthetic insights updates and case studies of maximum interest for knowledge of the historical seismology of Portugal and Spain *Slope Tectonics*

Michel Jaboyedoff, 2011 Usually geomorphology structural geology and engineering geology provide descriptions of slope instability in quite distinctive ways This new research is based on combined approaches to providing an integrated view of the operative slope processes Slope Tectonics is the term adopted here to refer to those deformations that are induced or fully controlled by the slope morphology and that generate features which can be compared to those created by tectonic activity Such deformation can be induced by the stress field in a slope which is mainly controlled by gravity topography and the geological setting created by the geodynamic context The content of this book includes slope deformation characterization using morphology and evolution mechanical behaviour of the material modes of failure and collapse influence of lithology and structural features and the role played by controlling factors *Subaqueous Mass Movements and Their Consequences* D.G. Lintern, D.C. Mosher, L.G. Moscardelli, P.T. Bobrowsky, C. Campbell, J.D. Chaytor, J.J. Clague, A. Georgiopolou, P. Lajeunesse, A. Normandeau, D.J.W. Piper, M. Scherwath, C. Stacey, D. Turmel, 2019-09-25 The challenges facing submarine mass movement researchers and engineers are plentiful and exciting This book follows several high profile



submarine landslide disasters that have reached the world's attention over the past few years. For decades, researchers have been mapping the world's mass movements. Their significant impacts on the Earth by distributing sediment on phenomenal scales is undeniable. Their importance in the origins of buried resources has long been understood. Their hazard potential ranges from damaging to apocalyptic, frequently damaging local infrastructure and sometimes devastating whole coastlines. Moving beyond mapping, advances in the subaqueous mass movement field have led scientists and practitioners to now also focus on assessing the consequences of mass movements and the measurement and modelling of events, hazard analysis, and mitigation. Many state-of-the-art examples are provided in this book, which is produced under the auspices of the United Nations Educational Scientific and Cultural Organisation Program S4SLIDE: Significance of Modern and Ancient Submarine Slope LandSLIDES. *Landslides and Engineered Slopes. Experience, Theory and Practice* (Stefano Aversa, Leonardo Cascini, Luciano Picarelli, Claudio Scavia, 2018-04-17) contains the invited lectures and all papers presented at the 12th International Symposium on Landslides, Naples, Italy, 12-19 June 2016. The book aims to emphasize the relationship between landslides and other natural hazards. Hence, three of the main sessions focus on Volcanic induced landslides, Earthquake induced landslides, and Weather induced landslides, respectively, while the fourth main session deals with Human induced landslides. Some papers presented in a special session devoted to Subaerial and submarine landslide processes and hazard, and in a Young Session, complete the book. *Landslides and Engineered Slopes. Experience, Theory and Practice* underlines the importance of the classic approach of modern science, which moves from experience to theory as the basic instrument to study landslides. Experience is the key to understand the natural phenomena, focusing on all the factors that play a major role. Theory is the instrument to manage the data provided by experience, following a mathematical approach; this allows not only to clarify the nature and the deep causes of phenomena, but mostly to predict future and, if required, manage similar events. Practical benefits from the results of theory to protect people and man-made works. *Landslides and Engineered Slopes. Experience, Theory and Practice* is useful to scientists and practitioners working in the areas of rock and soil mechanics, geotechnical engineering, engineering geology, and geology.

#### **Understanding and Reducing Landslide Disaster Risk** (Kyoji Sassa, Matjaž Mikoš, Shinji Sassa, Peter T.

Bobrowsky, Kaoru Takara, Khang Dang, 2020-12-21) This book is a part of ICL new book series ICL Contribution to Landslide Disaster Risk Reduction, founded in 2019. Peer-reviewed papers submitted to the Fifth World Landslide Forum were published in six volumes of this book series. This book contains the followings: Four Forum lectures and one award paper, Sendai Landslide Partnerships, Kyoto Landslide Commitment, and International Programme on Landslides. Landslide induced tsunamis, Landslides at UNESCO designated sites, and contribution from WMO, FAO, and IRDR. Education and Capacity Development for Risk Management and Risk Governance. Prof. Kyoji Sassa is the Founding President and the Secretary General of International Consortium on Landslides (ICL). He has been the Editor in Chief of International Journal Landslides.

since its foundation in 2004 Prof Matja Miko is the Vice President of International Consortium on Landslides and Vice President of Slovenian Academy of Engineering He is a Professor and Dean of Faculty of Civil and Geodetic Engineering University of Ljubljana Slovenia Dr Shinji Sassa is Head of Soil Dynamics Group and Research Director of International Research Center for Coastal Disasters Port and Airport Research Institute National Institute of Maritime Port and Aviation Technology Japan Prof Peter Bobrowsky is the President of International Consortium on Landslides He is a Senior Scientist of Geological Survey of Canada Ottawa Canada Prof Kaoru Takara is the Executive Director of International Consortium on Landslides He is a Professor and Dean of Graduate School of Advanced Integrated Studies GSAIS in Human Survivability Shishu Kan Kyoto University Dr Khang Dang is the Secretary General of the Fifth World Landslide Forum He also serves as the Research Promotion Officer of ICL and a Lecturer at the University of Science Vietnam National University Hanoi

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