High-Resolution Studies of Mass Transport Deposits: Outcrop Perspective for Understanding Modern Submarine Slope Failure and Associated Natural Hazards

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K. Ogata, G. A. Pini, A. Festa, Ž. Pogačnik, G. Tunis, J. J. Mountjoy, K. Senger, and M. Strasser

Abstract

Micro- to meso-scale outcrop studies on selected field analogues allow direct calibration and testing of geophysical interpretations performed on mass transport deposits in modern continental margins, in terms of genetic processes and sliding dynamics. This comparative approach provides important information for forecasting and mitigating submarine landslide-related geohazards. The comparison of fieldwork studies (i.e., siliciclastic, carbonate and mixed, seismic-scale Eocene-Oligocene submarine mass transport deposits of the Northern Apennines in Italy, central Pyrenees in Spain and the north-western Dinarides in Italy/Slovenia) with multibeam bathymetric, seismic and drill core data from some modern analogues (i.e., offshore of New Zealand, Japan and Svalbard in Arctic Norway) is proposed in order to upscale the outcrop observations and downscale the geophysical features. Our results show that slide mass mobility is a function of the degree of internal liquefaction/fluidization, mainly achieved at the basal sliding interval and within the slide body. This is due to undrained shearing/loading-unloading of poorly-lithified sediments, and consequent development of fluid overpressure that is able to accommodate deformations at high strain rates. Structures related to these processes are observable at all scales, and represent diagnostic criteria to recognize potentially catastrophic mass transport events.

Keywords

Exhumed mass transport deposits • Geophysical analogues • Shear-induced liquefaction

K. Ogata (✉)
Dipartimento di Fisica e Scienze della Terra, Università degli Studi di Parma, 43124 Parma, Italy
e-mail: kei.ogata@gmail.com; kei.ogata@unipr.it

G. A. Pini · G. Tunis
Dipartimento di Matematica e Geoscienze, Università di Trieste, 34010 Trieste, Italy
e-mail: gpini@units.it

G. Tunis
e-mail: tunis@units.it

A. Festa
Dipartimento di Scienze della Terra, Università di Torino, 10125 Turin, Italy
e-mail: andrea.festa@unito.it

Ž. Pogačnik
Salonit Anhovo, Building Materials, Joint-Stock Co, 5210 Deskle, Slovenia
e-mail: zeljko.pogacnik@salonit.si

J. J. Mountjoy
National Institute of Water and Atmospheric Research, 14901 Wellington, New Zealand
e-mail: joshu.mountjoy@niwa.co.nz

K. Senger
EMGS Electromagnetic Geoservices ASA, 0250 Oslo, Norway
e-mail: senger.kim@gmail.com

M. Strasser
Geological Institute, ETH Zurich, 8092 Zurich, Switzerland
e-mail: michael.strasser@erdw.ethz.ch

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