Geophysical Research Abstracts
Vol. 21, EGU2019-10609, 2019
EGU General Assembly 2019

Hydrological control of slope sediment deformation and catastrophic failure at the Nice Margin, Ligurian Sea

Achim Kopf (1), Nabil Sultan (2), Sebastien Garziglia (2), and Sebastien Migeon (3)

(1) University of Bremen, MARUM Center for Marine Environmental Sciences, Bremen, Germany (akopf@uni-bremen.de), (2) Ifremer, Centre de Bretagne, REM/RDT/I2M, ZI de la Pointe du Diable, Plouzané, France (Nabil.Sultan@ifremer.fr, Sebastien.Garziglia@ifremer.de), (3) UMR7329 Géoazur, 250 rue Albert Einstein, Batiment 1, 06560 Valbonne, France (migeon@geoazur.unice.fr)

Along the Ligurian slope near Nice, southeastern France, a combination of natural and man-made factors govern slope stability, and contributed to a devastating tsunamigenic landslide near Nice airport in 1979. Based on evidence from sediment cores we have characterized different facies types which represent the Pliocene – Holocene background sediment in the wider Nice area as well as deposits associated with the 1979 landslide and tsunami. Accompanying geotechnical results attest that significant strength variations exist when comparing measurements from the narrow shelf, shelf break and shallow slope as well as the 1979 slide scar. Factors such as groundwater charging in the granular, more permeable horizons further lower the effective stress and, in places, approach lithostatic. Above such permeable silt/sand beds, deformation of soft clay is observed, suggesting that leaching of ions from the clay mineral surfaces and frayed edges also facilitates weakening and creep, micro-slumping and folding. Elevated water supply as well as hydraulic fracturing of the clayey sediment is further attested by pipes of cm-diameter and several decimeters length, which entrained very soupy mud.
From 2007 onwards, we are also using mid- and long-term piezometer measurements to evaluate effective stress at different depths below the seafloor. The longest of these probes reaching 30 mbsf has recorded interesting temporal variations in pore pressure between 22 and 25 mbsf over a period of 4 years. Because at a similar depth interval a weak zone has been identified on CPTu data, questions arise as to the way pore pressure fluctuations are related to local groundwater hydrology and/or localised deformation and shear processes.
This motivated a collaborative research project between IFREMER Brest, GeoAzur at the Univ. Nice and MARUM at the Univ. Bremen to install new, innovative long-term instruments to monitor the slope displacement rates, fluid pressure and groundwater tracers along different locations by connecting to the EMSO real-time network. This work will be complemented by repeated bathymetric surveys as well as geotechnical laboratory tests and numerical modeling in order to elucidate the mechanisms and timing by which slope failure may develop.