EGU2020-19658, updated on 12 May 2020
https://doi.org/10.5194/egusphere-egu2020-19658
EGU General Assembly 2020

Imaging seafloor instabilities using very high-resolution deep-towed multichannel seismic data in the Gulf of Lions (NW Mediterranean)

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The Gulf of Lions (GoL) is a passive margin of about 200 km long and 70 km wide with main sediment supply from the Rhone River supplying Alpine sediments to the Rhone delta. Submarine landslides in the GoL are widespread from the upper slope to the deep basin, within the canyon flanks and in the interfluves of major canyons. The two main submarine landslides present in the GoL are the Eastern Rhône Interfluve Slide (ERIS) and an unnamed slide complex on the western side of the Petit Rhone Canyon. Their resulting mass transport deposits (MTDs), the Rhone Eastern MTD (REMTD) and the Rhone Western MTD (RWMTD) have previously been described in detail in several studies. However, due to the lack of high-resolution multidisciplinary datasets, such as high-resolution seismic, sediment cores, and *in-situ* geotechnical measurements, a detailed analysis of weak layers and preconditioning factors was never performed. Here, we present a suite of a multidisciplinary dataset; particularly very high-resolution deep-towed multichannel seismic data acquired using Ifremer's in-house acquisition system SYSIF (SYstème SIsmique de Fond) to assess seafloor instabilities in the GoL. The objectives of this study are twofold and aimed at 1) using deep-towed multichannel seismic data to capture the internal structure of the mass-wasting products previously imaged as seismically transparent or chaotic intervals in conventional seismic data; 2) using multidisciplinary dataset to analyse the basal surfaces of slope failures in the GoL. For the first time, the newly-acquired SYSIF data show in unprecedented detail the internal structure of mass-transport deposit along with small-scale slope failures. We present here an example of a failure that consists of slide blocks, folded and faulted strata with remnant stratigraphy previously associated with a transparent or chaotic facies in the conventional reflection seismic data. The combination of deep-towed seismic and sedimentological data, as well as *in-situ* measurements allowed us to analyse and characterize the nature of the basal surface of the slope failures in greater detail. We show that the basal surfaces of the recurring slope failures mainly consist of fine-grained clay-rich sediments as compared to turbiditic sequences typical of Rhone turbiditic system. Such observations suggest that greater degree of lithological heterogeneity in sedimentary strata promotes slope failure in the GoL, most likely related to higher liquefaction potential of coarser-grained material, excess pore pressure and possibly resulting variation in sediment strength.