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Geomorphology of multi-stage submarine landslides along the south eastern slope of the Gela Basin in the Strait of Sicily (Central Mediterranean Sea)

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This study presents the preliminary results of combined geomorphologic and geomorphometric analysis carried out on submarine landslides along the south-eastern slope of the Gela Basin, Strait of Sicily, Central Mediterranean Sea. The area is characterized by the presence of several offshore oil and gas exploitation plants and other marine infrastructures, located over the continental shelf near the coast and the upper slope, over which the submarine landslides may play a thread. The Gela Basin is the Plio-Quaternary foredeep of the Maghrebian fold-and-thrust belt and is squeezed between the accretionary wedge of the Gela Nappe to the north and the grabens opened during the rifting phase, which took place in the Strait of Sicily in late Miocene-Quaternary, to the south. Seismicity is low to moderate in the study area, but the structural setting, especially for the neo-tectonic component, is not completely understood and can be advocated as one of the controlling factors upon the widespread and recurrent mass transport events, that have been deposited along the entire slope. While the northern sector of the slope, where the “Twin Slides” are present, has been the subject of thoughtful and comprehensive recent stratigraphic investigations, including deep drilled cores, this contribution concentrates on the morphology of the south eastern sector of the margin, where the style of deformation of the displaced masses is different compared to the north, and where a higher number but slightly smaller (averagely 60 km2 in size) debris flow bodies are present.
The geomorphometric approach, applied to this study, combines feature-based quantitative representation, automatic mapping, and classical visual interpretation of high-resolution seafloor and sub-seafloor geophysical data, acquired with different multibeam systems and CHIRP technology. The data and the automatic mapping allow to differentiate single and multi-stage events, the overlapping areas between different age deposits, the average direction of the flows and their source areas. The headwalls of the landslides appear to decrease in size through time and to systematically cannibalize pre-existing larger headwall scars.
Although the landslides are moderate in size and run-out compared to other Mediterranean settings, a better understanding of the dimensions and geometries of the landslides will facilitate the geo-hazard assessment of the area, also in terms of tsunami generation potential. The numerical simulations of the tsunami potential will be presented in session NH5.1/OS2.12/SM3.07 – “Tsunami”. This contribution belongs to one of the research projects of the European Training Network ‘SLATE – Submarine landslides and Their impact on European continental margins’ funded by the European Commission in the frame of the H2020 Marie-Skłodowska-Curie program.