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Submarine landslides in the continental margins of the Mediterranean Sea: spatial distribution, major characteristics and implications for geohazard assessment

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Submarine landslides are ubiquitous on the Mediterranean continental margins and adjacent seas. Understanding the distribution of known submarine landslides is not straightforward because of incomplete coverage and lack of uniform studies in all areas. Nevertheless, during the last two decades, improvements in swath mapping and geophysical techniques, and growing interest of both academia and industry in these processes, have allowed to identify hundreds of submarine landslides. With the aim to understand the causes of the submarine landslides mapped in recent years in the continental margins of the Mediterranean Sea, we have undertaken a compilation of information from the scientific literature into a GIS-based framework. This work provides a first step towards understanding the role of geology in controlling the patterns, frequency and magnitude of submarine slope failures in the Mediterranean basin. Such analysis is an essential part in the assessment of submarine geohazards. Submarine landslides in the Mediterranean occur on tectonically dominated margins as well as on passive margins and volcanic island flanks. Large sedimentary wedges (Ebro, Nile, Rhone) appear to have a high density of large submarine slope failures. Tectonically active margins have numerous but relatively small failures. Most landslides in the Mediterranean originate in water depths exceeding 2000 m on slopes of 2º and most of them arrest only in slightly deeper water depths. This illustrates that a) most of the landslides in the database are relatively small, but also b) that the continental rise is a place of high slope instability compared to the continental slope and c) that limited energy is available for down-slope sediment transport, with most failures arresting shortly after triggering and/or producing little sediment transport. With regard to the age of the failure events little is known so far, stressing how little we know on the recurrence of these phenomena. Of the 524 submarine landslides events reported in the database, only 44 have somewhat accurate age determinations. The age of 128 events are simply reported in the literature with a geologic epoch, which induces a large error bar and makes almost impossible to establish a relationship with triggering mechanisms and environmental factors. Nevertheless, it is surprising the large amount of these 128 events that are reported as Holocene (68 events), which suggests that climate induced stress changes (sea level and bottom temperature changes and their effect on gas hydrate and gas systems, sedimentary load, . . .) have had a major role in triggering slope failures.