Geophysical Research Abstracts,
Vol. 11, EGU2009-10839, 2009
EGU General Assembly 2009

Giant sediment cover collapse in the offshore domain related to deep carbonate dissolution ?

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Atypical sub-circular structures are observed on seismic data beneath the inner shelf of the Gulf of Lions (Western Mediterranean). The largest and most dramatic structure is located 12 km offshore, at about 50 m water depth. It is up to 800 m high and 2 km wide. It is characterized by down-warped seismic reflections forming a concave V-shaped depression structure that can be followed vertically down to the base of the Plio-Pleistocene clastic sequence. The structure is rooted in the pre-rift substratum, possibly carbonated.
Seismic data is used to describe the global geometry and internal organization of the structure and underlying substratum, allowing to discuss its origin and development. It is proposed that it corresponds to a huge cover subsidence/collapse structure related to fluid circulation/dissolution and cave collapse in the subjacent carbonated substratum. We suggest that carbonate dissolution and void enlargement occurred within the substratum during the Plio-Quaternary, and up to recently. At some point, upward propagation of breakdown voids through the cohesive carbonates gave rise to the roof failure of an underlying cave together with the collapse or subsidence of the subjacent weakly lithified overburden, which deformed with a series of concentric extensional faults. The mechanism at the origin of the dissolution is not clearly established as carbonate dissolution in deep submarine environments is generally difficult to reconcile with traditional conceptual models for karstification. In this study, we hypothesis that the observed structure is possibly related to one or the combination of several factors among which the contribution of deep thermal circulation and/or water circulation along paleo-karst conduits. Present-day vertical fluid flows and groundwater discharge through the faults of the collapsed overburden should be considered.