Workshop IODP-Italia "Lo stato delle proposte di perforazione nell'area mediterranea"
Scientific Drilling in the Mediterranean Sea
Roma, 15-16 gennaio 2018

Abstract
Nuove idee per la perforazione scientifica

Landslides and deep-water contouritic processes along the Adriatic-Ionian region.

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Key words: (Submarine landslide, Contourites , Geohazard, Paleoclimate)

Abstract This is a proposal for a IODP expedition with both paleoceanographic and geohazard implications in the Mediterranean region. In particular Two key areas have been selected: the South Adriatic basin and the North Ionian region. This proposal intend to answer many of the questions highlighted in several studies related to paleocirculation, climate and sea-level controls on sediment architecture along continental margins as well as their instability and tectonic framework.

South Adriatic region

The South Adriatic proposal focuses on two main themes: 1) the significance and the relationships between deep water contouritic currents and the **paleo-oceanographic circulation patterns** and the paleoclimate variations of the Mediterranean region. 2) understand **landslides recurrence**, failure mechanisms and correlation with climatic changes by drill intact and failed sedimentary sequences at or near Plio-Quaternary mass-transport deposits.

Paleocirculation and climate.

The high accumulation rates associated with bottom-current deposits (BCD) in the Southern Adriatic region provides an expanded sedimentary record allowing to a detailed examination of paleocirculation patterns linked to past environmental changes. The Southern Adriatic BCD spans trough the relative uniform Pliocene climates to dynamic glacial/interglacial cycles during the Quaternary. The Adriatic region offers a good opportunity to understand the link between palaeoceanographic, environmental (climate and sea-level) and tectonic events from Messinian to recent time in a relatively undeformed sedimentary succession up to 1.5 km thick. The BDC is a basin-wide, composite sedimentary body, which has been developing along the abyssal plain and the mid-slope over the past 5 million years, under the influence of LIW-like deep water currents. An extensive collection of high quality seismic data exists for the region and a schematic seismic stratigraphic framework has recently been proposed, which can only be confirmed by deep drilling (*Industrial boreholes in the central, deep water sector of the basin are old and very scarce*). Is therefore necessary to drill through the drift succession and into late Miocene sediments at several different sites and consequently date the basal age of drift sedimentation in the South Adriatic. Multidisciplinary analysis allows to evaluate the nature of change in the patterns of sedimentation and environments from the early Pliocene to the Quaternary from the proximal to the distal basin regions of the South Adriatic margin. This allow to decipher the long and short-term interplay of deep and intermediate contour currents focusing mainly on the environmental changes linked to global rapid climatic events.

Geohazards and Landslides.

The architectural stacking pattern of the sedimentary succession of the BDC is sometimes interrupted by the presence of **large-scale mass-transport complexes (MTCs)** mainly linked to the failures of contourites-linked bodies or failures of shelfal progradational sequences. MTCs are spatially diffused along the margin and are characterized by high variability in size, morphology and geometries. Seismically MTCs consist of a quasi-transparent to chaotic seismic facies. The

oldest MTCs lie at depths below the seafloor that unreachable by standard sampling systems, therefore their ages, characteristics and lithological composition are unknown. This makes also virtually impossible an evaluation of the recurrence of the failures. As the Southern Adriatic basin represents one of the most seismic spots of the Mediterranean area, the need to understand the relative importance of earthquakes as triggers of landslides is therefore crucial.The consequences of landslides and landslide generated tsunamis (even of small magnitude) can be disastrous not only for offshore structures, but also for humans and near-shore structures.

IONIAN REGION

The Apulian ridge (North-eastern Ionian Sea), belonging to the Apulian Plate, represents the foreland system of both the Southern Apennines to the west and the Hellenic arc to the east, and is formed by thick Cretaceous carbonatic sequences and discontinuous tertiary deposits crosscut by a NNW-SSE penetrative normal fault system. A preliminary investigation on this fault system (through the analysis of regional-scale 2D seismic, high-resolution seismics and multi-beam echo sounder bathymetry integrated with sedimentological and geo-chronological analysis of sediment samples) allowed assessing the 3D continuity of structures imaged in 2D seismics, thanks to the occurrence of pervasive fault scarps on the seabed (only partly reworked by currents and covered by landslides). A penetrative network of relatively small faults, always showing a high dip angle, composes the NNW-SSE normal fault system, resulting in frequent relay zones (e.g. Huggins et al., 1995). Mutual cross-cutting relationships suggest that fault scarps on the seabed can be coeval with Quaternary submarine mass-wasting deposits colonised by Cold-Water Corals, which form coral-topped mounds on failed sediment blocks (Savini et al., 2016). Over a broader scale, we determined that coral topped mounds are particularly aggregated at the top of the regional blocks that dissect the Apulian Ridge through the NNW-SSE penetrative normal fault system (Etiope et al. 2010). Such configurations have been interpreted to be a result of a recent margin evolution that underwent regional uplift during the Late-Middle Pleistocene (Doglioni et al. 1994). Uplift reduced the accommodation space and created a physiographic context where large areas became swept due to local bottom-currents, especially on the tops of large-scale, up-thrown, faulted regional blocks due to their elevated position. Such areas include most of the portions of the coral-topped mounds mapped within mass transport complex. Although several evidences suggest therefore that fault activity lasted at least as far as the Holocene-Pleistocene boundary and that the NNW-SSW normal fault network in the Apulian Plateau can be considered active (or at least active till the Holocene-Pleistocene boundary), an exact stratigraphic framework describing the interactions between climate changes within the region, uplift and important mass-transport events, has been not still provided.

Present studies are going to improve the characterization of the fault system in the Apulian Plateau, in terms of geometry and kinematics analysing regional 2D seismic data recently obtained thanks to a signed agreement with a private company (Spectrum). Stratigraphic correlations have been proposed, but the inferred ages require drilling confirmation. A collection of core sediment at selected sites will indeed allow the production of new interpreted seismic maps that could better illustrate stratigraphic relationships between tectonic and mass-wasting events. Those observations will be used to produce an updated and more efficient tectonic/geodynamic model, and to test the hypothesis that the fault network are still active (even with moderate strain rates).