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Morphostructure and controlling factors on the past and present Gioia-Mesima submarine/channel system (Southern Tyrrhenian Sea, Italy)

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The Gioia-Mesima Canyon-Channel System (GMS) incises the Gioia Basin, a post-Tortonian intra-slope basin extended along the south-eastern Tyrrhenian margin, consisting in a subsiding area controlled by extensional faults.
Integration of multibeam, side scan sonar and seismic data with gravity cores has revealed the morpho-stratigraphic and sedimentologic characteristics of the GMS, allowing the identification of the main factors controlling its development and maintenance.
The GMS displays a complex morphology consisting in two courses: the Gioia Canyon (GC) and Mesima Canyon-Channel (MC). The courses running parallel, changing from narrow to meandering geometry until they merge in a single lower reach, hanging above the Stromboli Canyon- the main erosive valley of the Gioia Basin.
Seismic profiles documented the strong tectonic control on GMS geometry and development. Distensional structures cross-cutting the GMS caused changes in the slope gradient and formed a small intra-slope sub-basin. The progressive infilling of the sub-basin caused changes in GMS base level position, determining a polyphased evolution of the GMS through repeated erosional and depositional events that can be divided in two main stages.
The early stage is concurrent with the progressive infilling of the sub-basin. At this time the Gioia and Mesima courses have the same characteristics: narrow erosive canyons along the upper slope and depositional meandering channels in the sub-basin, where the GMS is confined. The GMS erosive-depositional character is revealed by the acoustic facies distribution. The narrow canyons incise a stratified seismic facies (hemipelagic and turbidite deposits) while the meandering channels are confined in a channel-levee seismic facies aggrading over the stratified one. The presence of numerous terraces hanging at several levels above the lower meandering reaches proves the polyphased evolution of the depositional meandering channels.
In the later stage, when the confined sub-basin is sufficiently filled, turbiditic flows bypass the Gioia and Mesima Channel-levée system and the GMS base level deepen to the Stromboli Canyon. The base level lowering lead to the single lower reach formation and the rejuvenation of the GMS by upslope incision.
At the present time the GC is an erosive shelf-indenting canyon, incising the whole continental slope. It has a narrow and entrenched course strongly deflected by faults and bordered by abandoned terraces in the middle reach. Otherwise, the MS is an abandoned valley hanging on the GC.
The present-day different activity of the courses is also documented by the quantitative analysis showing that the GC thalweg longitudinal profile has an irregular convex shape dissected by numerous knickpoints while the MC has an erosive-depositional concave-up longitudinal profile without knickpoints. The positions of the knickpoints upslope tectonic structures and canyon confluences show the retrogressive erosion of the thalweg. The retrogressive development is increased by downslope sediment transport mostly fed by fluvial discharge and retrogressive failures affecting the GC flanks and heads, where tsunamigenic landslides already occurred.
The aim of this talk is to summarize the major research results focus on the identification of the controlling factors responsible for the GMS polyphased evolution and present-day contrasting activity of the Gioia and Mesima courses.