Consiglio Nazionale delle Ricerche

CICLO DI SEMINARI

Martedì 28 Gennaio 2020
Sala riunioni terzo piano - ore 11:00-13:00
Via Gobetti 101, Bologna

ISTITUTO DI SCIENZE MARINE
Sede Territoriale (U.O.S.) di Bologna
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The Equatorial Mid-Atlantic Ridge: views on the spreading style of ridge segments under the influence of large offset, complex transform faults

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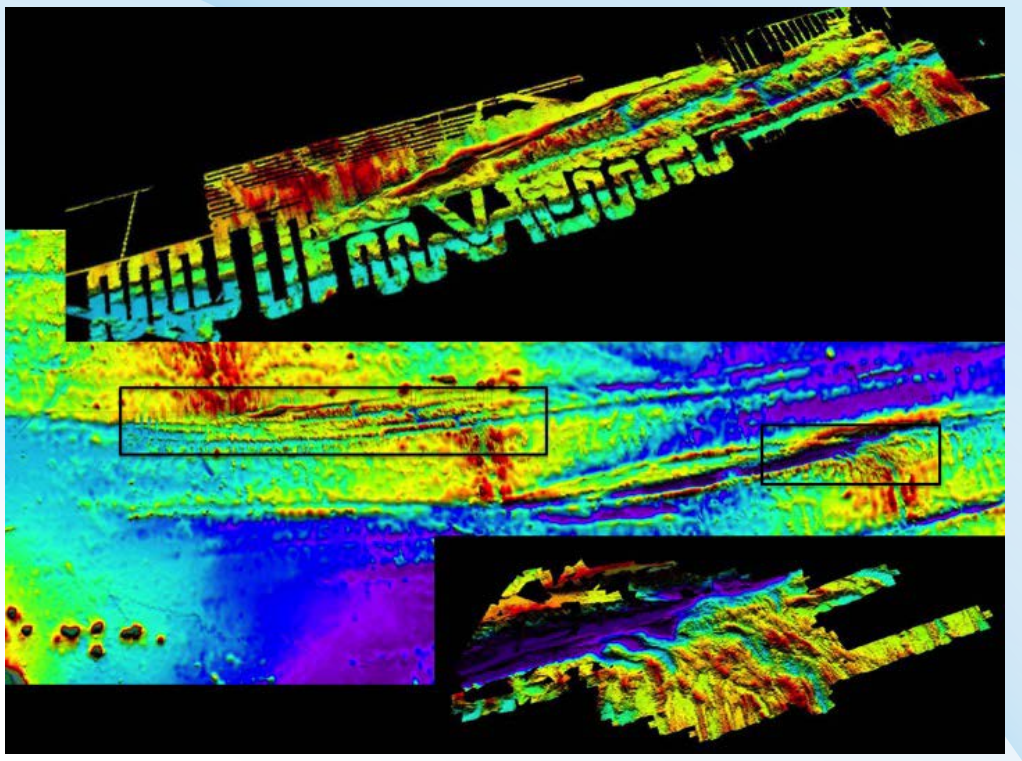
Two recent cruises (COLMEIA 2013 and SMARTIES 2019) acquired geophysical data and rock samples along segments of the Mid-Atlantic ridge in the Equatorial area. The St. Paul transform system is formed by four transform faults that bound three small intra-transform ridge segments. These segments display a variable morphology and structural patterns, as well as rock chemical composition, reflecting both the underlying mantle characteristics and the influence of the bounding transform offsets. The North segment, under the influence of the Sierra Leone HS displays a volcanic morphology while the South segment displays a series of detachment surfaces forming old gabbro-cored OCCs. The Central segment has the most complex structural pattern, with the axial valley bounded by peridotite hills. The MAR segment immediately south of the Romanche transform fault is particularly « cold », with large areas of the seafloor covered by mantle rocks, exposed by successive detachment faults.



The axis is very oblique and there is evidence of past axial instability. A highly faulted neo-volcanic ridge suggests that the magmatism is sparse and episodic, forming only a thin layer of basaltic oceanic crust. This exceptionally cold spreading regime is possibly mainly due to the effect of the Romanche mega-transform.

Large-scale structure of the Doldrums multi-fault transform system (7-8°N Equatorial Atlantic): Preliminary results from R/V Strakhov Expedition

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The Equatorial portion of the Mid Atlantic Ridge is displaced by a series of large offset oceanic transforms, also called "megatransforms". These transform domains are characterized by a wide zone of deformation that may include different conjugated fault systems and intra-transform spreading centers (ITRs). Among these megatransforms, the Doldrums system (7-8°N) is arguably the less studied, although it may be considered the most magmatically active. New geophysical data and rock samples were recently collected during the 45th expedition of the R/V Akademik Nikolay Strakhov. Preliminary cruise results allow to reconstruct the large-scale structure and the tectonic evolution of this poorly-known feature of the Equatorial Atlantic. Swath bathymetry data, coupled with extensive dredging, were collected along the entire megatransform domain, covering an area of approximately 29000 km2. The new data clearly indicate that the Doldrums is an extremely complex transform system that includes 4 active ITRs bounded by 5 fracture zones. Although the axial depth decreases toward the central part of the system, recent volcanism is significantly more abundant in the central ITRs when compared to that of the peripheral ITRs. On this basis, we infer that a region of intense mantle melting is located in the central part of the Doldrums system as consequence of either a general transtensive regime or the occurrence of a more fertile mantle domain. Large regions of basement exposure characterize the transform valleys and the ridge-transform intersections. We speculate that different mechanisms may be responsible for the exposure of basement rocks. These include the uplift of slivers of oceanic lithosphere by tectonic tilting (median and transverse ridges formation), the denudation of deformed gabbro and peridotite by detachment faulting at inner corner highs, and the exposure of deep-seated rocks at the footwall of high-angle normal faults at the intersection of mid-ocean ridges with transform valleys.