

IODP Proposal Cover Sheet

927 - Full

Tyrrhenian continent-ocean transition

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Title	Tyrrhenian Magmatism & Mantle Exhumation		
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Abstract

The objective of The "Tyrrhenian Magmatism & Mantle Exhumation" (TIME) project aims at studying the 3D time and space evolution of a continent-ocean transition (COT), from breakup to robust magmatism and subsequent mantle exhumation with closely time-related magmatism. The objectives include the kinematics of the opening, the crust and mantle deformation mechanisms, and the relationship of melting products to the exhumed mantle.

The database available to design the drilling project is possibly one of the best from a basin. The basement of the Tyrrhenian basin has been dredged at highs, and the stratigraphy is reasonably well known from three drilling expeditions, DSDP leg 13, DSPD leg 42 and the ODP leg 107 (Fig.1). In addition, a full-coverage high-resolution multibeam bathymetry of the basin helps the 3D interpretation of a large data set of vintage and modern 2D MCS reflection profiles.

The TIME project focuses in the youngest basin of the Western Mediterranean, formed from Upper Tortonian to recent by continental extension related to rollback of the ESE-SE migrating Apennine subduction system. Recent geophysics with coincident wide-angle seismic (WAS), gravity and multichannel seismic (MCS) reflection data support the presence of magmatic rocks formed during early COT phase, and of presumably subsequently exhumed mantle. The youth of the basin results in a modest sediment cover, facilitating sampling, with unprecedented spatial resolution, the peridotitic and magmatic basement across the conjugated COT of the basin.

Scientific Objectives

- 1) to determine the kinematics and geometry in space and time of the extensional deformation in the basin;
- 2) to establish the timing and origin of the associated magmatism;
- 3) to establish the rheology, deformation patterns and timing of mantle exhumation;
- 4) to determine the compositional evolution and heterogeneity of the mantle source;
- 5) to test current models of continental lithosphere rifting and of COT formation.

Non-standard measurements technology needed to achieve the proposed scientific objectives

Proposed Sites (Total proposed sites: 12; pri: 6; alt: 6; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
TYR-01A (Primary)	40.01745 10.9984	2675	286	50	336	The basement of the Cornaglia Terrace
TYR-02A (Primary)	40.00036 13.40327	2813	652	50	702	The basement of the Campania Terrace
TYR-03A (Primary)	40.18388 12.6413	3533	356	125	481	The serpentinized mantle peridotite
TYR-04A (Primary)	40.18402 12.72801	3546	773	50	823	The serpentinized mantle peridotites
TYR-05A (Primary)	40.26609 12.69432	3530	142	125	267	The serpentinized mantle peridotite
TYR-06A (Primary)	40.41593 12.72474	3592	902	50	952	The serpentinized mantle peridotite
TYR-07A (Alternate)	40.00097 10.98619	2700	286	50	336	Same target of TYR-01A, the basement of Cornaglia Terrace
TYR-08A (Alternate)	40.00036 13.39599	2837	548	50	598	Same target of TYR-02A, the Campania Terrace basement rocks
TYR-09A (Alternate)	40.18939 12.63243	3533	450	125	575	Same target of TYR-03A, the serpentinized mantle peridotite.
TYR-10A (Alternate)	40.18398 12.70826	3544	591	50	641	Same target of TYR-04A, serpentinized mantle peridotite.
TYR-11A (Alternate)	40.26614 12.70529	3538	327	125	452	Same target of TYR-05A, serpentinized mantle peridotites
TYR-12A (Alternate)	40.4159 12.7076	3590	1057	50	1107	Same target of TYR-06A, serpentinized mantle peridotites