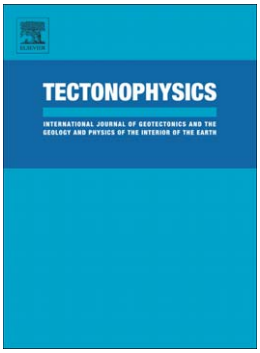

From stretching to mantle exhumation in a triangular backarc basin (Vavilov basin, Tyrrhenian Sea, Western Mediterranean)

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From stretching to mantle exhumation in a triangular backarc basin (Vavilov basin, Tyrrhenian Sea, Western Mediterranean)

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Abstract

In this study, we describe the mode of extension of the Vavilov, a fossil backarc basin, triangle-shaped (approximately 240 km-wide and 200 km-long), located between Sardinia margin to the west and Campania margin to the east. We combine the analysis of recent geophysical and geological data, in order to investigate the relationship between the crustal/sedimentary structure and the tectonic evolution of both apex and bathyal parts of the basin. With this aim, we interpret a large data set of multichannel seismic reflection profiles and several well logs. We observe that the apex basin corresponds to a sediment-balanced basin, with a sedimentary infill recording the episodes of basin evolution. In contrast, the distal basin corresponds to an underfilled basin, characterized by localized volcanic activity and a thin sedimentary succession that covers the exhumed mantle. The basin architecture reveal the occurrence of rift and supradetachment basins in the Vavilov rift zone. We find that the rifting of the Vavilov triangular basin was synchronous from the apex to distal regions around a single Euler pole located in Latium, between 5.1 and 1.8 Ma. The kinematic evolution of the Vavilov basin occurred in two stages: initial pure shear mode (5.1-4.0 Ma) produced high-angle normal faults and syn-sedimentary wedges, followed by simple shear mode (4.0-1.8 Ma) that caused supradetachement basins filled by a Transgressive-Regressive succession that documents high subsidence rates (1.22 mm/y) in the apex region. The final stage of extension in the distal region led to: (i) complete embrittlement of the crust; (ii) direct continuation of crustal faults to upper mantle depth; (iii) serpentinization and mantle exhumation. Based on constraints on the present-day crustal structure of the Vavilov basin, we obtain a stretching value (β =3.5) and extension rates (3 cm/y) in the bathyal zone analogous to those reported for magma-poor rifted margins.

Keywords: Triangular backarc basins, Tectono-stratigraphy, extensional modes, Vavilov basin, Tyrrhenian Sea.