ACTIVE FAULTING IN THE GULF OF CORINTH, GREECE

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Abstract

High resolution seismic profiling in the Gulf of Corinth indicates more complicate structure than thought up to now. Two equivalently active fault zones, each one composed of several en echelon arranged fault-segments, border the basin north- and southwards. The basin becomes narrower and shallower toward west, while significant transpressional deformation occurs along narrow zones.

Key words : Tectonics, Stratigraphy, Seismics, Sea Level

Introduction

The Gulf of Corinth is the most active extensional feature in Europe with a maximum extension rate in N-S direction of 7-16 mm/yr (1,2). With a general WNW-ESE elongate shape, the Gulf of Corinth separates the clockwise rotating Peloponese to the south from the relatively stable Central Greece to the North. The up to 900m deep basin crosscuts the NNW-SSE trending alpine structure of the Hellenides, limiting the occurrence of Parnass unit to the North and the external metamorphic belt to the South, and disrupting the nape structure of Pindos unit.

Faulting and evolution

A grid of densely spaced (every 1 mile) N-S single-channel Air Gun profiles was performed in the entire Gulf of Corinth (from Rion-Antirrion to the Gulf of Alkyonides) and provided maximum penetration of 1sec twtt within the basin's sediments and relatively high-resolution.

The present Gulf-of-Corinth basin is controlled by two main marginal fault zones, which run along the foot of the southern and northern submarine slopes. Each fault zone consists of a number of E-W trending, en echelon arranged, fault-segments. Both slopes are steep and display extensive failure phenomena. In contrast to the proposed asymmetric character of the basin (3), favoured by most workers up to now, the structure of the present-day Gulf of Corinth appears much more complicate.

Starting from the East, the Psatha fault and its westward prolongation along the foot of the southern slope controls the evolution of the Gulf of Alkyonides basin. Both the sea-bed and the sediments dip southwards, while the lowermost horizons of the 400m thick basin infill are correlated with the Pleistocene conglomerates of the inactive Megara basin, presently exposed at 300m altitude (4).

Moving to the West, the 800-900 m deep basin of the central Gulf of Corinth displays rather symmetric character. The basin infill consists of continuous turbidite sedimentation and is intersected by narrow zones of transpressional deformation, bordered by E-W trending, intra-basinal, high-angle faults. Massive sliding structures occur all along the steep southern and northern slopes. The Perachora peninsula, which is bordered by the NW-facing Perachora fault and the S-ward dipping Loutraki fault, separates the central basin of the Gulf of Corinth from the N-ward tilted Lechaion Gulf basin.

Further to the West the active Gulf of Corinth basin becomes significantly narrower and shallower, while the maximum sediment accumulation thickness decreases gradually from >800m in the eastern part to <400m off Aigio. Between Galaxidi and Aigio the basin infill consists mainly of chaotic slide masses, while continuous sedimentary reflectors are poorly observed. The lower horizons of the sedimentary sequence are strongly deformed and dip gently to the N, indicating a possible N-ward tilting of this part of the basin.

The westernmost part of the basin is occupied by the prodelta and distal deposits of Erineos and Mornos rivers. Frequent slope failure phenomena occur along both the southern and northern 200m high escarpments, which border the narrow basin.

The southern margin of the present Gulf undergoes continuous uplift, indicated by the presence of elevated marine terraces (5,1), and the uplifted Pleistocene delta deposits in Northern Peloponese (6). Opposite to that, the northern margin of the Gulf undergoes continuous subsidence during the last 250 ka, as shown by the presence of several low-sea-level-stand prograding sequences on the outer self and upper slope off Eratini (7).

Discussion

The present Gulf of Corinth represents the last stage of an older structure, which initiated in Upper Miocene – Lower Pliocene. The opening of the basin either started earlier in the eastern part or prograded faster in the east than in the west. This assumption may explain the widening, deepening and higher sediment accumulation of the basin toward East and coincides with the clockwise rotation of Peloponese. During the evolution of the basin the southern active margin was migrating northwards and the northern one remained more or less stable inducing northward shifting of the active basin. The rather complicate structure of the present day Gulf of Corinth basin is not easily explained by the presence of a low-angle N-dipping normal fault / seismogenic layer below the Gulf, which is proposed by many authors.

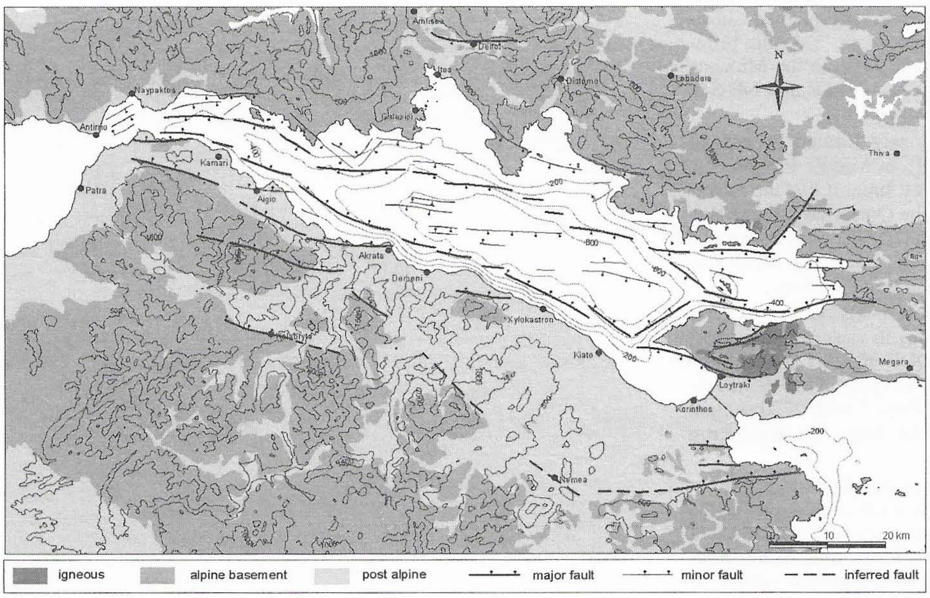

Fig. 1: Active faulting in the Gulf of Corinth basin.

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