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North-south transfer zones and paleo-morphological reconstruction of the Xylokastro area (Corinth Gulf, Greece)

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Abstract

A large number of studies have documented the structural and sedimentary architecture of the Corinth Gulf, especially the major E–W trending normal faults important in accommodating the main extensional strain and associated growth of the Gilbert fan deltas. However, the role of several N–S oriented structures that crop out at the surface and are detectable at depth by seismic reflection and gravity surveys are not clearly understood. Based on new geological data, collected near Xylokastro, we describe the N–S oriented tectonic activity of this area. The mapped inland faults correspond to off-shore structures identified in re-interpreted seismic lines and appear to have acted as a major transfer zone during the opening of the Corinth Gulf. Reconstruction of the paleo-topography based on sedimentary facies and the environment of clay mineral formation suggest these transfer zones played an important role in controlling both local structural relief and depositional conditions of the Gilbert fan deltas.

Keywords: Corinth Gulf; Fault network; Tilted blocks; Transfer zone; Clay minerals; Slope deposits; Geological analogue

1. Introduction

The aim of this paper is to document the geometry and geological evolution of transfer faults in a seismically active area of the central zone of the southern Corinth Rift and to present a paleo morphological reconstruction for the region. Structural and sedimentological data, in combination with the analysis of clay mineral assemblages and seismic profiles, are used to reconstruct the timing of activity on the faults and their effect on the geomorphological development of a currently active rift system. The role of oblique faults as transfer structures between two extensional faults is an aspect poorly documented and not well understood in the Corinth Rift, especially in the region of Xylokastro. Here, we pay special attention to this area and highlight their important structural and morphological role in influencing the tectonics of the southern edge of the Corinth Rift system.

The Corinth Rift is one of the most seismically active areas in Europe. This activity is related to N–S extension strain, which commenced during the lower Miocene (Jolivet et al., 1994; Armijo et al., 1996; Kokkalas et al., 2006). The main origin of crustal extension is attributed to the gravitational collapse of the Hellenide orogenic belt and back arc thinning induced by subduction and roll-back of the African plate below the Eurasian margin (Doutsos and

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