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Pre-rift basement structure and syn-rift faulting at the eastern onshore Gulf of Corinth Rift

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We present results of recent field-based research with a view to providing information about and constraints on the initiation and evolution of the Gulf of Corinth (GoC) Rift. The onshore geology and structure of the GoC rift has been studied intensively and extensively; however most research efforts have focused on the western and partly the central parts. The last few years, efforts are being made to extend the scope of research in less-studied areas, such as the eastern southern onshore part of the GoC rift, trying to address two major issues in rift initiation and evolution, namely syn-rift faulting and pre-rift basement structure.

While fault spacing and length appears to be well-constrained for the western and central parts of the GoC Rift, further east –and especially in the uplifted onshore southern part- this is thought to increase dramatically, as there are practically no mapped faults. We argue, however, that this may be a false image, owing to (i) the difficulty in identifying fault structures within a thick, fairly monotonous syn-rift sequence; (ii) the lesser attention this part has drawn; and (ii) the fact that the published summary geological and tectonic maps of the GoC area are based on the dated geological maps that cover the eastern and northern onshore shoulders of the Rift. Moreover, new field data provide new information on pre-rift structure: while only the topmost thrust sheet of the Hellenide nappe stack (Pindos Unit) was thought to crop out at the eastern southern onshore part, we mapped the underlying, non-metamorphic carbonate Unit (Tripolis Unit), which crops out within the footwall of a key intra-basin block (Xylokastro block). A minor outcrop further east, may also belong to this Unit, providing basement control, in connection with recently published offshore fault data. The mapping of these outcrops, combined with a revised stratigraphical framework for the early syn-rift deposits, allows the identification and mapping of faults within this less studied area.

Regarding the pre-rift basement structure, not only the known, or inferred, pre-rift heterogeneities along rift axis, but also ongoing lithospheric processes affect the evolution of the GoC Rift. The suggestion that the exposure of the deeper metamorphic Units at the southern border of the rift is related to an earlier (?Miocene) age, thus constituting an inherited structure, is at odds with results from geothermochronological data from the southern Peloponnesus and Kythira, which suggest that these Units lay at a depth of at least 4 km in the Middle ((?)Late) Miocene. This means that the metamorphic outcrops at the southern border of the GoC Rift are the product of a later (possibly Quaternary) process of uplift, probably resulting from localized N-S culmination, whose locus is in the central Peloponnesus. Moreover, current (and Upper Quaternary) uplift rates along the southern shoulder of the GoC may also be related to and/or reflect the uplift of the nappe pile including the lower, metamorphic basement Units.