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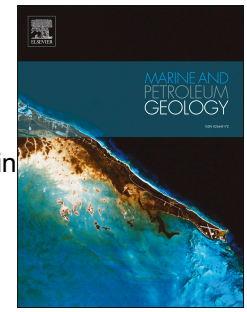

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Age and geodynamic evolution of the Black Sea Basin: tectonic evidences of rifting in Crimea

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Key words:
Fault; paleostress; graben; rifting; back arc basin; inversion; Black Sea; Crimea

Abstract:

The timing and direction of opening of the Black Sea Basin are debated. However, parts of its margins were inverted during Cenozoic and can be studied onshore. The Crimean Mountains are located in the middle of the northern margin of the basin, and at the onshore prolongation of the mid-Black Sea High.

We present the first detailed mapping of large striated normal faults in Crimea. These faults define graben structures that trend parallel to the continental margin. Kinematic analysis of the faults combined with new biostratigraphic data show that the syn-rift sequence is Valanginian to Late Albian in age. It consists of siliciclastic deposits with limestone olistoliths. In contrast, the post-rift Late Cretaceous carbonaceous sequence of Crimea is devoid of normal faults or olistoliths. It unconformably overlies the graben structures.

The onset ages, and the trends of extension are quite similar in the northern (Crimea) and the southern (Turkey) inverted margins of the basin. The Early Cretaceous extension directions are normal to the mid-Black Sea High and the Black Sea margins. We conclude that rifting of Black Sea Basin occurred from the Valanginian to the Late Albian (~35 My) and drifting during the Late Cretaceous.

Based on the directions of rifting, on the lack of evidence of strike slip motions near the mid-Black Sea High, and on published paleomagnetic data, we propose that the Black Sea opened with rotations accommodated by transform faults at its western and eastern margins, as a response to asymmetric slab rollbacks of the Neo-Tethys plate.

The inversion of the Crimean margin results from two successive shortening events: Early Eocene NE-SW compression, Eocene to Present SE-NW compression. Their timing support the idea that compressional stresses generated by continental collisions in Turkey were transmitted through the strong Black Sea lithosphere up to Crimea.

1-Introduction:

The Black Sea is a 2200 m deep marine basin surrounded by alpine mountains including the Balkanides, the Pontides, the Greater Caucasus and the Crimean Mountains (Fig. 1A). Because of