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The Meso-Cenozoic Tectonic evolution of Eastern Black Sea and Caucasus domain: state of the art and perspectives of research

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Meso-Cenozoic back-arc basins (BAB) in the Black Sea - Caucasus (BS-CA) domain formed within the strong European continental lithosphere lying over a long-lived subduction zone (100-120 My). Various scenarios have been proposed to explain the opening of the BS and CA basins, but the underlying processes controlling their formation remain unclear (e.g. Okay et al., 1994; Stephenson and Schellart, 2010, Okay et al., 2013). One reason is that the nature (oceanic? or highly extended continental lithosphere?) of the BS and CA is not so well understood; why was the BS basin preserved as a basin in a region that everywhere sustained compression and collision from Late Cretaceous to recent? The long duration of oceanic lithosphere being subducted beneath Eurasia is supported by the reconstruction of the Neotethys domain (e.g., Barrier and Vrielynck, 2008; DARIUS maps in prep.). The Kure-Tauric, Greater Caucasus (GC), western and eastern BS basins directly opened on top of this long-lived subduction zone but were inverted in the Late Triassic-Early Jurassic (Cimmerian orogeny) for the Kure-Tauric basin, the Paleocene ("Alpine orogeny") for the GC and the BS basins. The GC BAB opened in the Early-Middle Jurassic (no oceanic crust was formed however), and the western and eastern BS basins opened during the Cretaceous and/or Cenozoic. The published paleotectonic reconstructions additionally suggest that in the late Early Jurassic (Toarcian) the oceanic plate length between Gondwana and Laurasia was approximately 3500 km. The long-lived subduction process is also evinced by tomographic images obtained beneath Eurasia and Anatolia. Although these images are not of high resolution they reveal the presence of what can be interpreted as cold, remnant Neotethys subducted lithosphere in the upper (from 500 to 660 km depth) and lower mantle (Spakman, 1991; Faccenna et al., 2006; Lei and Zhao, 2007; Zor, 2008).
Groups of researchers from different countries (e.g. DARIUS, GDRI groups) have worked together on the BS and CA domain (see for example the GSL special publication vol. n°428: Sosson et al., 2017). The results published over the last years and our knowledge of the target area has led to these hypotheses: 1) structural heterogeneities (mainly anisotropic lithospheric-scale shear zones) within the Eurasian upper plate could be responsible for the geometry and the spatio-temporal evolution of the BS BABs; 2) the forces driving the opening of BABs are directly related to subducted slab motion and its behaviour in the mantle (roll back, break-off, slab window?) and 3) the inversion of the sub-basins of the BS, well expressed on their margins since 50 Ma, is primarily controlled by inherited structures, including the normal and strike slip faults formed during the initial rifting phases BABs (Permo-Triassic basins, BS and GC). This presentation will outline these main results and hypothesis in order to define the main research objectives for answering the questions mentioned above on this optimal tectonic domain: the BS CA domain