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Extensional history of the eastern Black Sea from integrated subsidence analysis and wide-angle seismic data

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We present initial results from subsidence analysis and newly collected wide-angle seismic reflection/refraction data that constrain the crustal structure and extensional history of the eastern Black Sea basin. The eastern Black Sea provides a good natural laboratory for the study of extensional basins due to the thick sequence of sediments ($\sim$12 km), which host a record of the subsidence history, and the proximity of the conjugate margins, which make it possible to collect continuous geophysical data across the entire rift system in one experiment. By answering specific questions regarding the opening of the eastern Black Sea, we gain generic insights into the processes important to the formation of deep rift basins and rifted margins and their evolution through time.

Although the Black Sea consists of one large depocenter today, previous geophysical studies reveal that the basin can be divided into two sub-basins, which have different tectonic histories. These investigations largely agree that the western Black Sea opened as a back-arc basin in the late Cretaceous during subduction of the NeoTethys and culminated in initial seafloor spreading. The timing and extent of opening in the eastern Black Sea, however, is subject to debate. Competing theories call for the opening of the eastern Black Sea in the Jurassic, late Cretaceous (simultaneously with the western Black Sea), or Paleocene/Eocene. Furthermore, previous investigations disagree on the nature of the thinnest crust in the eastern Black Sea; gravity studies suggest this crust is approximately 10 km thick, implying that it could either be thinned continental crust or thick new oceanic crust.

To address these uncertainties regarding the tectonic history of the eastern Black Sea, we employ a two-part study that includes both subsidence analysis and crustal seismology. Firstly, we analyze the subsidence history recorded by stratigraphy using the 2D strain rate inversion technique of White and Bellingham, 2003. This method uses flexurally backstripped stratigraphic horizons to recover temporal and spatial variations in strain rate. Initial results suggest that extension in the eastern Black Sea continued into the Eocene, regardless of when it initiated. From the middle Eocene until the middle Miocene, cooling of the lithosphere and passive infill can explain observed subsidence patterns. During the last ten million years further tectonic deepening of the eastern Black Sea basin took place; we attribute this later deepening to compression, after other authors. Secondly, we collected wide-angle seismic refraction data in the eastern Black Sea in February 2005 aboard the *Iskatel* to delineate deep crustal structure, which will provide clues as to the style (pure shear v. depth-dependent stretching) and extent of extension in this area. We show examples and initial models from these data.