



Abrupt crustal thinning at the southern margin of the eastern Black Sea basin

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The eastern Black Sea basin is thought to have formed by back-arc extension during the closure of the Tethys ocean. The main rifting event has been interpreted by different authors to be as young as Paleocene or as old as Jurassic. The basin currently lies in a compressional setting associated with the uplift of the Caucasus mountains, but compressional tectonics appear to affect only the edges of the basin. The extensional history of the basin is recorded by 8-10 km of Tertiary sediments, with stratigraphic control through ties to exploration boreholes onshore and in the western Black Sea basin. Acoustic basement here is commonly interpreted to be formed from Cretaceous platform carbonates and volcanic rocks that outcrop on the margins of the basin.

In February-March 2005 we conducted a major seismic experiment across the basin. We acquired four long wide-angle seismic profiles across different parts of the basin, using a 9-gun, 3140 cu. in. airgun array, tuned to provide a seismic source rich in low frequencies. On each line, between 14 and 34 four-component ocean bottom seismometers (OBSs) were deployed, and the airguns were fired at 60-90 s intervals. Shots were also recorded on land stations up to 50 km from the coast. Here we focus on a 250 km profile extending from the southern margin of the basin into its centre. On this profile, the crust thins abruptly from ~ 32 km to ~ 8 km over ~ 30 km distance across the margin. An analysis of subsidence data also indicates abrupt thinning in the same location. Such abrupt thinning is common at transform margins but rare at rifted margins. In the centre of the basin, the crust has low velocities, with a maximum velocity of ~ 6.5 km/s at the base of the crust and no evidence for velocities typical of oceanic layer 3. We infer that highly thinned continental crust is likely present across a region up to ~ 150 km wide. This interpretation is consistent with the presence of

up to 1-2 km of Mesozoic sediments in the centre of the basin that appear to predate the main extensional episode inferred from subsidence analysis. Thus the margin has some characteristics of a “narrow” rift but others more typical of a “wide” rift.