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Converted PS-Wave Velocity Structure Of Post-Rift Sediments In the Eastern Black Sea

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The combined analysis of P- and S-waves can be used successfully to characterize lithology and pore fluids, resolving ambiguities that would result from the analysis of P-wave data alone. Knowledge of S-wave velocity may also contribute to pore pressure estimation using either empirical relationships or rock physics models. Using wide-angle seismic data collected from the Eastern Black Sea Basin (EBSB) in 2005, and building on a previously published P-wave velocity model, we have used travel-time forward modeling and inversion to produce a two-dimensional S wave velocity model. We model an approximately 100 km southeast-northwest transect in the eastern part of the EBSB where 15 ocean bottom seismometers (OBS) were placed between the coast and the centre of the basin. The OBS were equipped with three orthogonal 4.5 Hz geophones and a hydrophone. We have used the data from the two horizontal geophone components to detect S-waves generated by mode conversion at sub-seabed horizons and to identify the corresponding P wave reflection. The data are of excellent quality and we were able to analyse both P-wave reflectors used in previously published works along with some new reflectors found during the processing of this model. Previous analysis has revealed the presence of is a wide-spread low-velocity zone within the basin fill, which coincides with the Maikop formation, an important sedimentary sequence of this region due to its potential as a hydrocarbon source. This low-velocity zone is interpreted as due to excess pore pressures. Our detailed S wave model extends to 3.5 km below the seabed, with a single layer beneath this depth that extends to a deeper horizon marking the base of post-rift sediments.The Poisson's ratio varies from approximately 0.485 close to the seabed to $\sim$0.32 in the deepest layer. In the low velocity zone there is an increase of the Poisson's ratio, from $\sim$0.38 for the layer above, to $\sim$0.42 for the low velocity zone. Using a rock physics model, we interpret these velocities in terms of pore pressure variations within the basin fill.

Keywords: Black Sea, P-S converted waves, Poisson's ratio