

Three-dimensional Structure of the Cinarcik Basin from a Densely Spaced Grid of Seismic Reflection Profiles, SEISMARMARA Experiment

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The North Anatolian Fault (NAF) has been responsible for the earthquakes of Izmit and Duzce in 1999. The presence of a seismic gap in the Sea of Marmara has led an extensive marine research in recent years. The SEISMARMARA survey was carried out in 2001 as a combined seismic reflection, refraction and earthquake experiment in the Marmara region. R/V Le Nadir was equipped with a 4.5 km long streamer and a large single-bubble airgun source. During Leg 2, about 2300 km of seismic data were acquired in the Cinarcik Basin and its margins, using a 2900 cu.in. source and a shooting interval of 37.5 m. The dataset comprises 82 lines shot at N13 azimuth (approximately at right angle to the basin margins) and spaced 600 to 900 m apart, and one strike line perpendicular to these dip lines. Processing of this homogeneous, high-quality dataset was achieved, including detailed velocity analyses, multiple suppression - taking advantage of the larger offsets available - and post-stack time migration. The resulting sections provide insight into the structure and tectonic activity of the Cinarcik Basin. Imaging of active normal faults along the NNE and SSW margins of the basin indicate that this basin can be viewed as a releasing, underlapping side-step governed by two strike-slip segments, the Izmit fault being the eastern segment. These bounding faults seem to have had a complex geological evolution, both in space and time. The top of the basement appears as a high-amplitude reflector and can be traced mainly in the eastern and southern parts of the basin. Sedimentary infill consists of two major sedimentary units, previously called the upper and lower sequences, and which may be related to two different tectonic stages. The westward thinning of the upper sequence suggests that the basin is propagating eastward. A rough estimate of the maximum sedimentary thickness is about 5 km. We present here the 3-D geometry of the Cinarcik basin and discuss its evolution in space and time, and its relationship with the rest of the Marmara Sea and the North Anatolian fault system.