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Discovery of a New Major Strand of the North Anatolian Fault in the Sea of Marmara: Evidence for the Development of a Straighter Main Displacement Zone

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The Sea of Marmara its on an active shear zone, called the Marmara Shear Zone, a part of the North Anatolian Shear Zone. According to Tchalenko (1970), an evolution of a shear zone occurs at six phases. The results of the previous researches showed that the Marmara Shear Zone is at the last phase called “residual”. It is confusing that, the Çınarcık Basin, which is the largest basin in the Sea of Marmara and accommodated in a shear zone thought to have reached the “residual” phase, contains shear structures less often in the middle parts and depths of the basin. By contrast, seismicity exists not only in the edges, but also in the central part of the basin. Therefore, it is imperative that this basin ought to be re-examined.

Within the scope of this study, a part of the multi-channel, single-channel seismic reflection and chirp data collected from previous investigations were reprocessed and interpreted. Because these data are products of various studies, resolutions differ from each other. It helps to investigate structures at different depths.

As a result of the interpretation of all the available data, it is seen that there are canyons that feed the basin, folds that occur changing of the orientation of the fault probably, landslides that cover the surface rupture of the faults, and both transtensive and transpressive areas in the Çınarcık Basin. All of these are the traces of the structures developed in a shear area. The most important result of this study is, however, the discovery of a new fault cutting the Çınarcık Basin lengthwise. This new fault departs from the Main Marmara Fault off the Prince Islands. Westward, it follows the middle of the basin; cuts the folds, which are identified as box folds by previous researchers; and reaches the fault branches accommodated in the Central High. This new fault displays both negative and positive flower structures in the middle part of the basin.

As a conclusion, in this study fault map of the Çınarcık Basin was updated by gathering all results. It is revealed that the new fault is located in the middle part of the Çınarcık Basin by following the Riedel and P Shears, which are the significant traces of a shear zone. This fault is interpreted as the “Y Shear” of the Marmara Fault Zone and this is a new proof of the fact that the Sea of Marmara is in its “residual” phase. The next big earthquake may be located on this ‘newer’ structure.