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To understand the submarine features of the Kucukcekmece Lagoon, a total of 42 km high resolution seismic reflection data and total field marine magnetic data were collected and processed. The results were interpreted together with bathymetric data in detail. Total magnetic intensity distribution identifies several north-northwest trending (340-350⁰) magnetic lineaments (L1-L5) that are aligned with strike-slip faults mapped from offshore seismic data. Analytic signal depth estimates indicate magnetic source bodies at ~100 m depth within the Thrace Basin Cenozoic sediments. Further analysis of the magnetic field data would provide information on faults kinematics and depth. Stratigraphically, parallel reflection pattern of the lagoon indicate initial deposition under low-energy conditions. From place to place, some whiteout areas are interpreted as gas charging area. Structurally, three main fault zones, FZ1, FZ2 and FZ3 are mapped with strike-slip character in NW-SE orientation. These faults delimit the lagoon from eastern and western coast where the bathymetry decreases from 10m to 5m and is characterised by two linear NW-SE directed feature on the seafloor morphology. The direction of active faults of the lagoon are also well matching with onland NE-SW oriented ridges and lineaments toward northern part of the lagoon and southern coast area. The right lateral displacement at the coast line of the lagoon in the northern Sea of Marmara and strike-slip character of FZ1, FZ2 and FZ3 are thought that these fault zones maybe related with the North Anatolian Fault Zone (NAFZ). In terms of reducing the high seismic risk posed with increased urbanization of the densely populated Istanbul, it becomes significant to monitoring or identification of the continuities of these faults in current sediments represented at the shallow parts of the seismic sections.

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