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The Nature and Subsurface Geometry of Late Holocene Coquina Rocks, Karaburun-Istanbul, NW Turkey

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The so-called coquina defines moderately to hardly amalgamated shell debris by calcium carbonate cement. Even though its some depositional features are similar to intertidal beachrocks and carbonate-cemented dune rocks or eolianites, coquina occurs in shoal environments and is, in some cases, representative of tectonically uplifted coasts when it exposes remarkably above sea-level. In this study (supported financially by the Research Foundation of Çanakkale Onsekiz Mart University under project number COMUBAP: 2011/41), we discuss diagenetic features, radiocarbon age and subsurface geometry of coquina on Black Sea coast of Istanbul, NW Turkey, where such a Late Holocene occurrence has not been recorded so far. Having a visible thickness of 1 m, the coquina beds crop out on a slightly inclined wide beach formed mostly of shell fragments less than 5 cm in size. It contains calcite and aragonite as connective cement and broken or unbroken shells of Donacilla sp., Pecten glaucum and Ostrea edulis together with various foraminifera such as Elphidium macellum Ammonia compacta and coccolithophore Emiliania huxleyi. Radiocarbon ages from four bulk samples yielded calibrated ages ranging between 3.7 and 2.8 ka BP.

Electrical resistivity tomography survey along three distinct transects perpendicular to the coastline were carried out in order to understand the thickness of coquina and its subsurface extensions along the beach. The apparent resistivity data were acquired along the survey lines of 21 electrodes with electrode spacing of 2 m, to give a total length of the line of 40 m. Dipole-dipole electrode configuration was used for 9 data levels. Topographic changes at the locations of each electrode points were determined by means of optical leveling technique for a more accurate calculation and interpretation. Apparent resistivity data were inverted by using 2D smoothness-constrained least squares algorithm. Similar electrical resistivity tomograms were obtained for three lines after the inversion process. The 2D resistivity images displayed a depth range of $\sim$ 4.5 m and showed a strong resistivity contrast between coquina beach material (composed of shell fragments) and coquina rocks. Low resistivity values located at the northern lowermost part of tomograms point to seawater saturated material whilst the highest resistivity values indicate coquina beach material, having larger pore spaces between the grains. The northern uppermost parts of the tomograms, having a moderate resistivity range, mark the coquina rocks with a thickness of $\sim$ 1-1.5 m. Additionally, the images also showed that the landward extension of the coquina rocks reaches $\sim$ 22 m.

Keywords: Coquina rocks, diagenetic features, radiocarbon age, subsurface geometry, İstanbul-Turkey