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Determining change of bathymetry with GPR method in Ordu-Giresun, a sea-filled airport in the Black Sea, Turkey

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Ordu-Giresun (OGU) is a newly-constructed airport, the first sea-filled airport in Turkey and in Europe, and the second airport in the world after Osaca-Japan. The airport is between Gulyalı district in Ordu city and Piraziz district in Giresun city in Black Sea -Turkey. A protection breakwater has been constructed by filling a rock approximately 7.435-m long and with an average height of 5.5 m. Then, the Black Sea has been filled until 1 m over the sea level, approximately the area is 1.770.000 m^2 wide and includes a runway, aprons and taxiway covered by breakwater. The runway has a 1-m thickness, 3-km length and 45-m width, PCN84 strength, and stone mastic asphalt surface. The aprons has a 240 x 110 m length and PCN110 strength, the taxiway is 250 x 24 m wide. The airport was started to be constructed in July 2011 and it began to serve on 22th May 2015.
The aim of this study was to determine the depth of the rock-filled layer and the amount of sinking of the bathymetry which has been determined before filling processing. In addition, before bathymetry determination, unconsolidated sediments had been removed from the bottom of the sea. There were four drilling points to control the sinking of the bathymetry. Therefore, six suitable Ground Penetrating Radar (GPR) profiles were measured, crossing these points with runway and aprons, using 250-MHz and 100-MHz shielded antennas.
Starting points of the profiles were in the middle of the runway to merge between depth and thickness changing of the filled layer and bathymetry along the profiles. Surface topography changing was measured spaced 1 m apart with 1 cm sensitivity on each profile. At the same time, similarly the topography changing, bathymetry coordinates was re-arranged along the each profile. Topography corrections were applied to the processed radargrams and then the bottom boundary lines of the rock-filled layer were determined. The maximum height was 3.5 m according to the sea level, which was on the middle point of the runway, representing zero depth of the radargrams of the profiles. To determine the amount of the sinking of the rock filled layer, the first sea level were lined at 3.5 m in depth on the right side depth axes of the radargrams. The second, bathymetry changing lines were placed on the interested radargrams. Finally, differences between the bottom boundary lines of the filled layer and bathymetry lines were compared. The results showed that GPR method could be applied successfully to determine the depth of the rock filled layer in Black Sea and the small amount of the sinking of the bathymetry.

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