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ON THE USE OF DEM BY UNMANNED AERIAL VEHICLE AND AIRBORNE LIDAR DATA IN LOCAL GEOID MODEL DETERMINATION AND VALIDATION

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ABSTRACT

The digital elevation model (DEM) in varying accuracy and resolution from different techniques can be obtained and these models are used for obtaining the height information with many purposes in variety of the applications today. Beside of this, the precise geoid models are employed for transforming the ellipsoidal heights obtained by the GNSS techniques into the regional height datum. Many countries including Turkey still lack of such a high-precision regional geoid model to be used for this purpose in their geodetic infrastructure. The regulation for the large scale mapping and spatial data production of Turkey provides standards for local geoid modelling in geodetic and surveying applications that require a 5 cm height transformation accuracy at most, and encourage the professionals to use the local geoid models for height determination. Different kind of data including GNSS/leveling heights at the reference benchmarks, gravity data obtained through the gravimeters at different platforms as well as the astrogeodetic observations, are employed for precise determination and independent testing of the geoid model.

This study aims investigating the performance of digital elevation model data obtained from the point cloud data by the airborne LIDAR (Laser Imaging Detection and Ranging) and unmanned aerial vehicle (UAV) in local geoid modeling and testing in İzmir Bergama district. The study area has a moderate topography pattern and heterogeneous construction density which affects the performance in DEM generation from point cloud data. Hence different filtering algorithms were employed to process the point cloud data obtained by LIDAR technology and UAV

photogrammetry. The generated DEMs were primarily compared with the local geoid model in the territory. The results were validated with the Turkey Geoid (TG) 2003 regional and the EIGEN6C4 global geoid models. The results of this study clarify whether the LIDAR techniques provide sufficient accuracy for geoid verification or not.

Key words: Orthometric, Elevation, UAV, LIDAR, Point Cloud, Geoid

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