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Mapping of Quaternary river terrace landforms with Unmanned Aerial Vehicle (UAV): A case study in the Sakarya River, NW Turkey

Ebubekir Karakoca¹ and Levent Uncu²

¹Bilecik Seyh Edebali University, Social Sciences Institute, Geography, Turkey (ebubekir.karakoca@bilecik.edu.tr)

²Bilecik Seyh Edebali University, Social Sciences Institute, Geography, Turkey (levent.uncu@bilecik.edu.tr)

River systems are areas that respond most rapidly to regional and / or local tectonic movements, with global climate changes and general basement fluctuations that occurred during the Quaternary period. The most important geomorphological units where these events can be observed are terrace systems, which are the result of deposition and erosion processes. In fluvial geomorphology research on terrace systems, modern technological innovations are used as well as conventional field methods. Especially low-cost Unmanned Aerial Vehicles (UAV) and modern photogrammetry methods are preferred because they both provide detailed and precise identification of terraces and high resolution topography outputs in spatial and temporal terms. This study aims to put a comprehensive mapping of the terrace systems observed in an area of 1.27 km² around Gemiciköy (Bilecik Province), which is located in the middle part of the Sakarya River valley, the largest river in Northwest Anatolia. Accordingly, we used the Structure from Motion (SfM) method which is based on photogrammetric principles and UAV. During the study, 582 images taken from a height of 100 m and having 80% overlap in line with the flight plans by using the DJI Mavic Mini UAV model were evaluated in Agisoft Metashape Professional software. With the use of image processing algorithms, the dense point cloud was first obtained, and then the orthomosaic and digital surface model with 3.29 cm resolution was produced. Two terrace levels (+10 m and +19 m) detected with digital surface modeling, and these were verified by stratigraphic and sedimentological observations made in the field. As a result, low-cost UAV technologies are quite useful in terms of providing more detailed monitoring, mapping and analysis of river environments, together with the production of sensitive and high resolution topography data required in modern fluvial geomorphology research.