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## Karst Topography Analysis Based on Multi-sensor (UAS & LiDAR) Data Acquisition

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The state-of-the-art in surveying of open surface the last few decades is based on Point Cloud processing and interpretation. Lately, similar technology tends to be used for indoor surveying as well. One of the extreme applications is the use of the exact same technology in underground karstic cavities, evolving the methodology used in cave mapping. Geometric and morphometric analysis of the caves or any containing components (speleothems) include various techniques aiming at quantifying their dimensions in order to determine the characteristics and consequently the relationship between the cavity morphology and the surrounding structural, lithological and hydrogeological properties. The purpose of this research is to combine high resolution topographic data acquired with different instruments for both the underground morphology of a karstic cave (Koutouki, Peania, Greece) and the open-air surface above it. The described methodology is based on photogrammetric processing of Unmanned Aerial System image data and the extraction of a point cloud recorded with the use of a handheld laser scanning system. The latter resulted a 3D model of the cave and led to the production of a digital relief for the roof of the cave, which in turn was combined with the digital terrain model of the open-air surface above the cave. The final product is a high-resolution information layer with measurements of the rock thickness between the roof of the underground karstic structure and the open-surface topography with high accuracy.