The value of a UAV-acquired DEM for flood inundation mapping and modeling

Guy J.-P. Schumann (1), Joseph Muhlhausen (2), and Konstantinos Andreadis (3)

(1) Remote Sensing Solutions, Inc. (USA)/University of Bristol (UK), (2) CielMap, LLC (USA), (3) California Institute of Technology/NASA Jet Propulsion Laboratory, Pasadena, CA, USA

Remotely Piloted Systems also known as Unmanned Aerial Vehicle have rapidly developed as tools for remote sensing and mapping and publications referring to RPS remote sensing applications is increasing each year. In particular Structure from Motion (SfM), a relatively new photogrammetry approach has been documented for various applications. Some papers have focused on the accuracy of the output generated by SfM by validating relative and absolute accuracy using ground control points, others have looked at various applications. Yet we argue that a major aspect of SfM has been overlooked, its ability to generate highly accurate point cloud models without the use of ground control points. We demonstrate this by comparing with a LIDAR DEM, a dataset which has been transformative in flood inundation research and applications. Our results demonstrate that a point cloud collected using a RPS and a 16M pixel Bayer sensor camera using a rolling shutter can achieve a RMSE of 39 cm compared to LIDAR. We conclude that a SfM model is not only highly accurate but could complement LIDAR for floodplain mapping and modelling, especially in cases where smaller coverage is sufficient and LiDAR acquisition via airplane may be too costly or impractical.