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A comparison of using Unmanned Aerial Vehicles (UAV) and mobile video for establishing surface flow velocity measurements using the LSPIV method on the River Arrow, Warwickshire.

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Using digital video sequences for the collection of surface flow velocities has proven an effective remote method for monitoring flow rates during flood conditions. However, questions remain with regards to the accuracy of different platforms used during data collection. The use of video acquires various sources of error including camera shake, reflection of light on the water surface and the presence or absence of seeding material; such errors can severely obscure the accuracy of velocity measurements obtained and may vary between different platforms. This study aims to compare the velocity measurements obtained from two different platforms: an Unmanned Aerial Vehicle (UAV) and a GoPro camera.

Fieldwork was conducted on a small channel approximately 5m wide and 20m long on the River Arrow, Warwickshire, UK. During data collection, the surface flow rate averaged approximately 0.3m/s. Surface flow velocities were collected via a DJI Phantom 4 UAV (vertical video), and 2 x GoPro Hero 3 (oblique video) fixed on telescopic poles on either side of the channel. Cameras were situated at different elevations and angles to allow various light conditions to be assessed simultaneously, both with and without seeding material. Videos recorded 2 minutes of flow at 30 frames per second with a resolution of 1080p. Two sets of measurements were recorded at similar flow rates (within a time-gap of 4-minutes) both with and without eco-foam seeding on the water surface. Videos were processed to calculate Surface flow velocities using the Fudaa-LSPIV developed by LeCoz et al. (2010) and compared against in-situ electromagnetic current meter readings collected at near surface flow (0.5m intervals across five cross sections of the reach). Results will be presented that compare the surface flow velocities between different platforms including i) the presence or absence of seeding, ii) the % of water surface reflectance and the impact upon the accuracy of surface flow measurements and iii) the accuracy of discharge calculations (comparisons will be drawn from in-situ measurements).