Aerial tracer particle distribution system for surface image velocimetry

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Abstract

A novel aerial tracer particle distribution system has been developed. This system is mounted on an Unmanned Aerial Vehicle (UAV) and flown upstream from where surface velocimetry measurements are conducted. This enables surface velocimetry techniques to be applied in rivers and channels lacking sufficient natural tracer particles or surface features. Lack of tracers is a common problem during low flows, in lowland rivers, or in artificial channels. This is particularly problematic for analysis conducted using Particle Image Velocimetry (PIV) techniques where dense tracer particles are required. Techniques for colouring tracer particles with biodegradable dye have also been developed, along with methods for extracting them from Red Green Blue (RGB) imagery in the Hue Saturation Value (HSV) colour space. The use of coloured tracer particles enables flow measurements in situations where sunglint, surface waves, moving shadows, or dappled lighting on riverbeds can interfere with and corrupt results using surface velocimetry techniques. These developments further expand the situations where surface velocimetry can be applied, as well as improving the accuracy of the results.

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