DRONESYSTEMS

Funded by the European Union

River Discharge Survey

Discharge and hydraulic roughness from three contactless UAV measurements

WHAT IT IS

River discharge is estimated from three UAV surveys at one cross section: the water surface slope (WSE survey), the cross-section geometry (riverbed geometry survey) and the surface velocity (flow velocimetry survey). Discharge and hydraulic roughness are estimated jointly, with the method of Bandini et al. (2021). Nobody enters the water.

TYPICAL USES

- **Ungauged sites:** discharge where there is no station, or where a station needs checking.
- **Rating curves:** establishing or validating the stage-discharge relation, including at high flow.
- **Water resources and hydropower:** flow accounting at intakes, confluences and abstraction points.

WHAT YOU GET

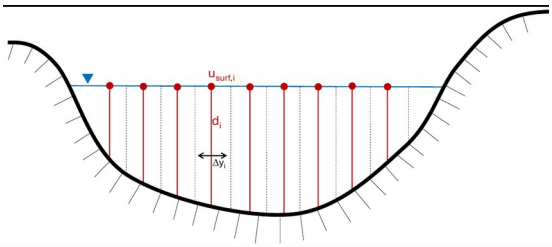
- Discharge per cross section with an uncertainty estimate and the fitted Strickler roughness (CSV).
- All three underlying datasets: WSE profile and slope, cross section, surface velocities.
- Documented example: Torne River, Sweden, two 600 m wide sections. UAV estimates were within 3–9 % of ADCP ground truth (295 and 288 m³/s) depending on the velocity-profile method.

HOW IT IS DONE

- WSE route long enough to see at least 10 cm of fall across the section (about 200 m at a slope of 50 cm/km), one geometry cross section, one velocity cross section.
- Expected relative accuracy 15 % or better. Geometry can be reused from an earlier survey if the bed is stable.
- WSE and velocity can be flown BVLOS under PDRA-G03; the geometry cross section is flown VLOS.

PRODUCTIVITY

- **VLOS:** 0.5–1.0 discharge cross sections per hour, all three measurements included.



Method: surface velocity (red) and depth per vertical across the measured cross section; the water surface slope comes from the WSE profile. Drawing from UAWOS D3.4.

KEY FACTS

Inputs	WSE slope, cross-section geometry, surface velocity
Method	Joint estimation of discharge and roughness (Bandini et al. 2021)
Accuracy	15 % or better relative; 3–9 % at Torne River
Sensors	LX-80 altimeter, LiDAR + radar/sonar, RSS-2-300W Doppler
Platform	DJI M300 RTK; BVLOS for WSE and velocity
Output	Discharge, uncertainty, roughness, datasets

WHAT A QUOTE COVERS

- Planning and preparation
- Survey days, crew of two
- Transport and accommodation
- Processing of the three datasets and the discharge estimate

Prices depend on reach length, number of cross sections, access and VLOS/BVLOS. Quote on request.

CONTACT

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