DRONESYSTEMS

Funded by the European Union

Flow Velocimetry Survey

Surface velocity across river cross sections from a UAV Doppler radar

WHAT IT IS

A 24 GHz Doppler radar (Geolux RSS-2-300W) measures the surface velocity of the water without any contact. The UAV hovers at points along the cross section, 4 m above the water with true terrain following, 20 seconds per point, on two lines just upstream and downstream of the section. No wading, no boat, no need to be in the water during floods.

TYPICAL USES

- **Flow characterisation:** velocity distribution across a section, for hydraulic assessment and model validation.
- **Discharge:** the velocity input to the UAV discharge workflow, including at sites and conditions where ADCP or wading is unsafe.
- **Gauging checks:** surface velocity at gauged sections during high flow.

WHAT YOU GET

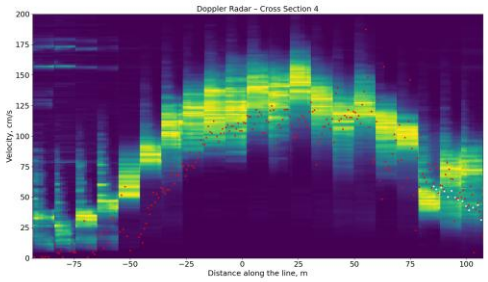
- Surface velocity along each cross section, accuracy 0.1 m/s or better, as CSV (position, velocity) and velocity plots.
- Raw Doppler spectra (SEG-Y) and position logs on request.

HOW IT IS FLOWN

- Hover points 4.0 m above the water, two flight lines offset 4.4 m up- and downstream of the section, true terrain following; propeller downwash is removed in processing.
- Data quality depends on water surface roughness: very slow, smooth water gives weak signals, so sections are placed where the surface is rougher (narrower reaches, different bed).
- BVLOS flights are operated under EASA PDRA-G03 in the 'specific' category with a survey UAV and a relay; VLOS flights in the 'open' category.

PRODUCTIVITY

- **VLOS:** 0.75–1.5 cross sections per hour; 5–20 minutes of flight per section, the rest is access and setup.
- **BVLOS:** measured on the November 2026 Gudenå survey (35 cross sections); figures follow in the next revision.



Example output: Doppler radar velocity spectrum along a cross section (Torne River, XS4).

KEY FACTS

Sensor	Geolux RSS-2-300W 24 GHz Doppler radar, SkyHub
Accuracy	0.1 m/s or better
Altitude	4 m above the water, true terrain following
Positioning	RTK (NTRIP) or PPK
Platform	VLOS: DJI M300 RTK · BVLOS: Dronevolt Kobra with relay
Output	Velocity per section, CSV and plots

WHAT A QUOTE COVERS

- Planning and preparation (section placement, access, permits)
- Survey days, crew of two (BVLOS: UAV and relay link)
- Transport and accommodation
- Data processing and reporting

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

CONTACT

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Workflow developed in UAWOS – Unmanned Airborne Water Observing System, Horizon Europe grant agreement 101081783 · uawos.dtu.dk · Technical basis: UAWOS surveying protocol D3.3 (Flow Velocimetry Surveying Protocol) · DRAFT 3 November 2026