DRONEWATER – High Resolution UAV Imagery Applied to Water Management

Summary

Lightweight, portable "unmanned aerial vehicles" (UAVs or DRONEs) are set to become a vital component of a water resource management (WRM) toolkit but are currently not widely used in this context. In practical, there is a growing need for fine-scale sensitive data, which cannot be delivered from satellites or aircraft in a cost-effective way.

There is a shortfall in current remote sensing data provided concerning the following two challenges that cannot be met with current satellite or airborne imaging survey technologies:

- Cost-effective capture of fine-scale spatial data describing the current hydrological condition and water resource status at user-defined time-steps.
- Data capture at the fine temporal resolution for describing water system dynamics in soil moisture, vegetation, and topography.

A new emerging opportunity for on-demand, self-service, timely spatiotemporal water resource evaluation is offered by UAVs. With careful design, deployment, and safe operation, UAV platforms could provide scale-appropriate data that are otherwise difficult to obtain from most other remote sensing platforms.

It is within this framework that the DroneWater project is presented. This project aims to develop new methodologies, based on the image acquisition by UAVs, to assess complex processes related to WRM.

The relevance of this proposal has based the fact that UAVs are used to evaluate and characterize the interaction processes between surface water and groundwater, and how this interaction influence the end users (people and/or ecosystems).

The methodology combines colour (RGB), near-infrared (NIR) and thermal imaging obtained at low altitude and later calibrated through field measurements.

The case studies in which the methodology will be applied include the following cases:

- Assessment of water exchanges between surface and groundwater bodies and their relationship to dependent ecosystems and users.
- Delimitation of groundwater recharge and discharge zones through the mapping of soil moisture, land use and vegetation type.
- Delimitation of river basins and reassessment of drainage pattern due to changes in the landscape.
- Monitoring of invasive species and mapping of indicator species for water availability and water quality.
- Water bodies pollution assessment from agricultural origin through vegetation indexes.

Given the case studies nature, there is a natural relationship between them since they allow knowing the quantity and quality for various types of water bodies. In this way, one of the main objectives of the project will be the integration of previous results into water stress indicators.

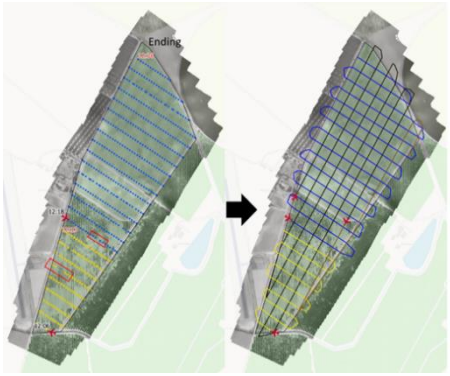

Figure 1. Flight log to evaluate soil changes.

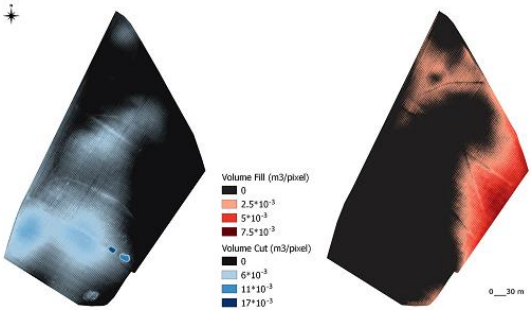

Figure 2. Assessment of volume changes after soil tillage.

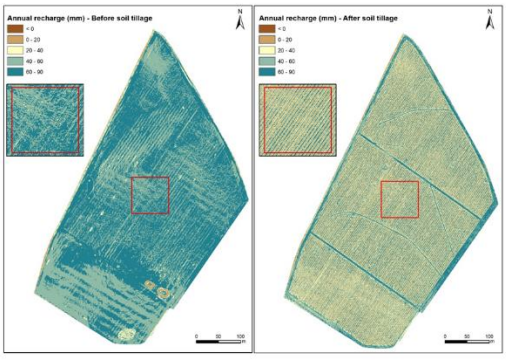

Figure 3. Assessment of changes in recharge.

Project Reference

PTDC/CTA-OHR/32360/2017

Leading Institution

IST-ID – Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal)

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CERIS

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Project Website

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