G-EAU
Gestion de l'Eau, Acteurs, Usages
Water matters

Origin and dynamics of surface water in the Cambodian floodplains: Insights from simple and low-cost environmental tracers

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CONTEXT

Cambodian floodplains are inundated for four to six months across vast, flat deltaic landscapes. Near-zero gradients make flow directions hardly predictable and traditional hydrometric methods less easily applicable: velocity meters need a defined cross-section; water level loggers reveal stage but not direction, connectivity between meanders change regularly. Yet knowing where water goes, how it mixes, and how long it stays is critical for anticipating changes in water quality, pollutant fate, microplastics dispersal, and ecological balance.

Hydrochemical tracers : EC, temperature, stable isotopes ($\delta^{18}O$, $\delta^{2}H$) carry information on water origin, residence time, and mixing that no current meter can provide. They propagate as measurable signals even across a flat, apparently homogeneous flooded landscape, and can be cross-validated with hydrodynamic data, modelling, and satellite imagery.

SCIENTIFIC OBJECTIVES

- **Origin:** identify water sources (river, rain, groundwater, irrigation) in space and time
- **Dynamics:** trace water movement and infrastructure control (canals, gates, levées) on connectivity
- **Residence time:** estimate renewal rates and travel times via tracer time-series and signal propagation

A scale-change perspective will be enabled by three nested sites :

- **Scale 1 — field mosaic (~1–10 ha):** EC and temperature gradients reveal inter-parcel flows invisible to conventional sensors.
- **Scale 2 — flooded landscape (~100 km²):** tracer surveys expose mixing zones, water age, and connectivity.
- **Scale 3 — river corridor (~200 km):** longitudinal profiles reveal source dynamics, groundwater inputs, and floodplain exchanges.

THE MISSION

Based on existing data, the student will:

- Organise, quality-control, and document the tracer dataset
- Map tracer distributions (GIS, transects, interpolated surfaces, satellite overlay)
- Analyse time-series; identify flood-pulse responses and directional shifts
- Apply end-member mixing analysis to delineate source contributions
- Apply signal propagation (cross-correlation, transfer functions) to estimate travel times
- Cross-validate with hydrodynamic data, modelling outputs, and satellite imagery

REFERENCES

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THE RESEARCH UNIT: G-EAU

- G-EAU is an interdisciplinary research unit located in the North of Montpellier at the Agropolis campus
- It unites both social and natural scientists interested in the study of water - from hydrogeologists and remote sensing experts to human geographers and sociohydrologists
- Students will be able to integrate themselves into a rich and welcoming environment of scientific diversity. Weekly events include the Friday discovery seminar series (Vendredi Découverte), and the communal coffee social every Tuesday.