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Functional trait-based numerical modelling of feedbacks between river morphodynamics and riparian vegetation for river research and sustainable management

Virginia Garófano-Gómez, Florent Arrignon, Frank Vautier, Eric Tabacchi, Elisabeth Allain, Anne Bonis, Sebastien Delmotte, Eduardo Gonzalez, Frédéric Julien, Luc Lambs, et al.

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39th IAHR
WORLD CONGRESS
GRANADA, SPAIN 2022
From Snow to Sea
19-24 June 2022



Functional trait-based numerical modelling of feedbacks between river morphodynamics and riparian vegetation for river research and sustainable management

V. Garófano-Gómez, F. Arrignon, F. Vautier, E. Tabacchi, E. Allain, A. Bonis, S. Delmotte, E. González, F. Julien, L. Lambs, F. Martínez-Capel, A-M. Planty-Tabacchi, E. Roussel, J. Steiger, J-P. Toumazet, I. Till-Bottraud, O. Voldoire, R. Walcker, D. Corenblit

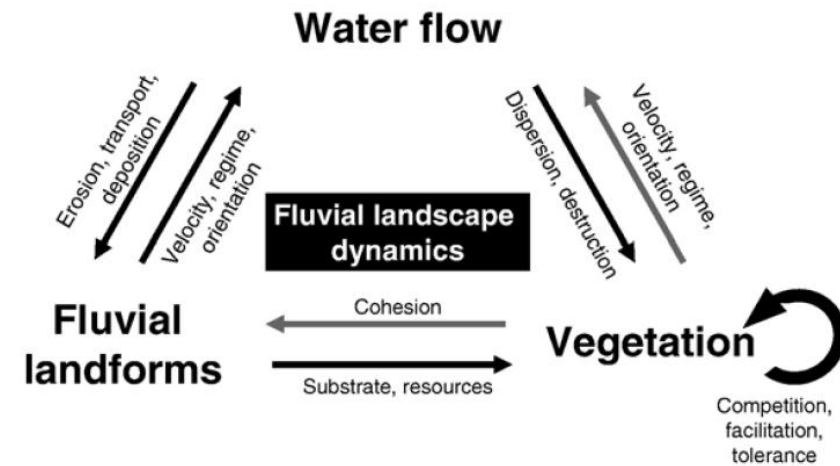
NUMRIP (ANR Project 2022-2025)

Projet-ANR-21-CE32-0007

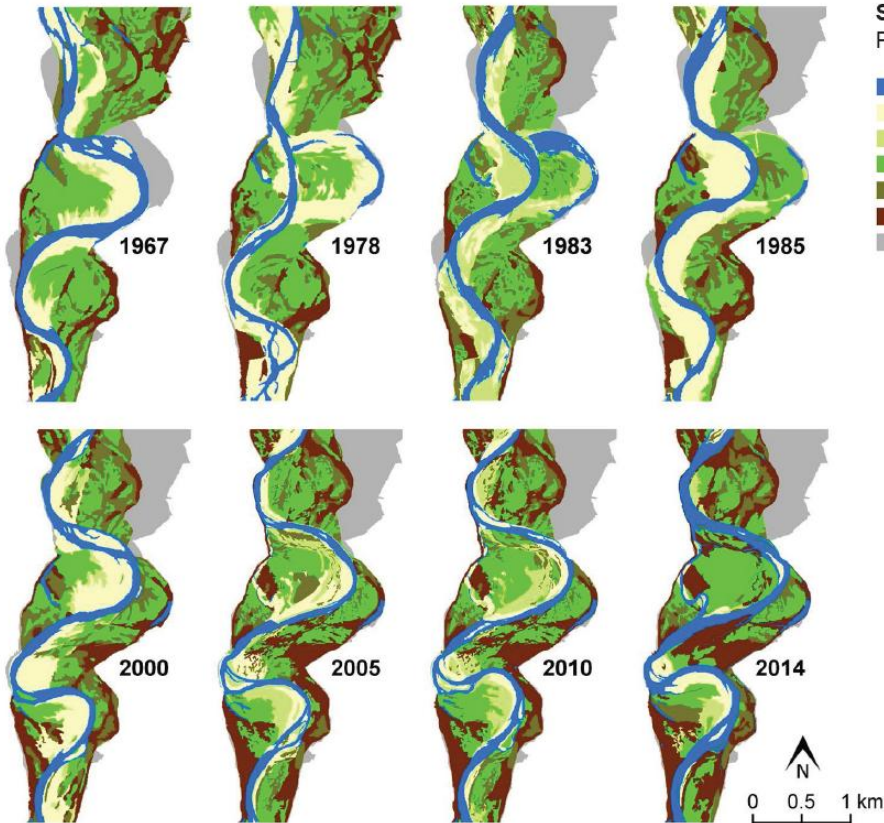


#From Snow to Sea

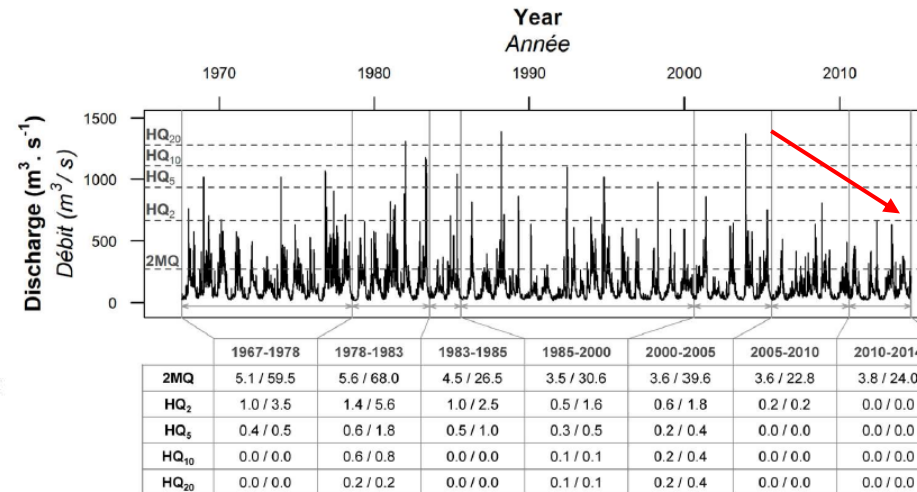
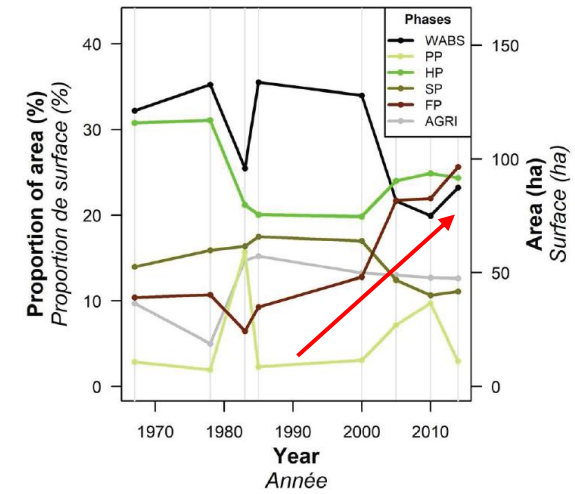
- Fluvial corridors are among the most dynamic ecosystems on Earth.
- There is an urgent need to restore the functioning of rivers.
- NUMRIP project aims to build a tool (numerical model) to quantify and simulate fluvial landscape dynamics with the explicit consideration of feedbacks between vegetation dynamics and river morphodynamics integrating a functional trait approach.

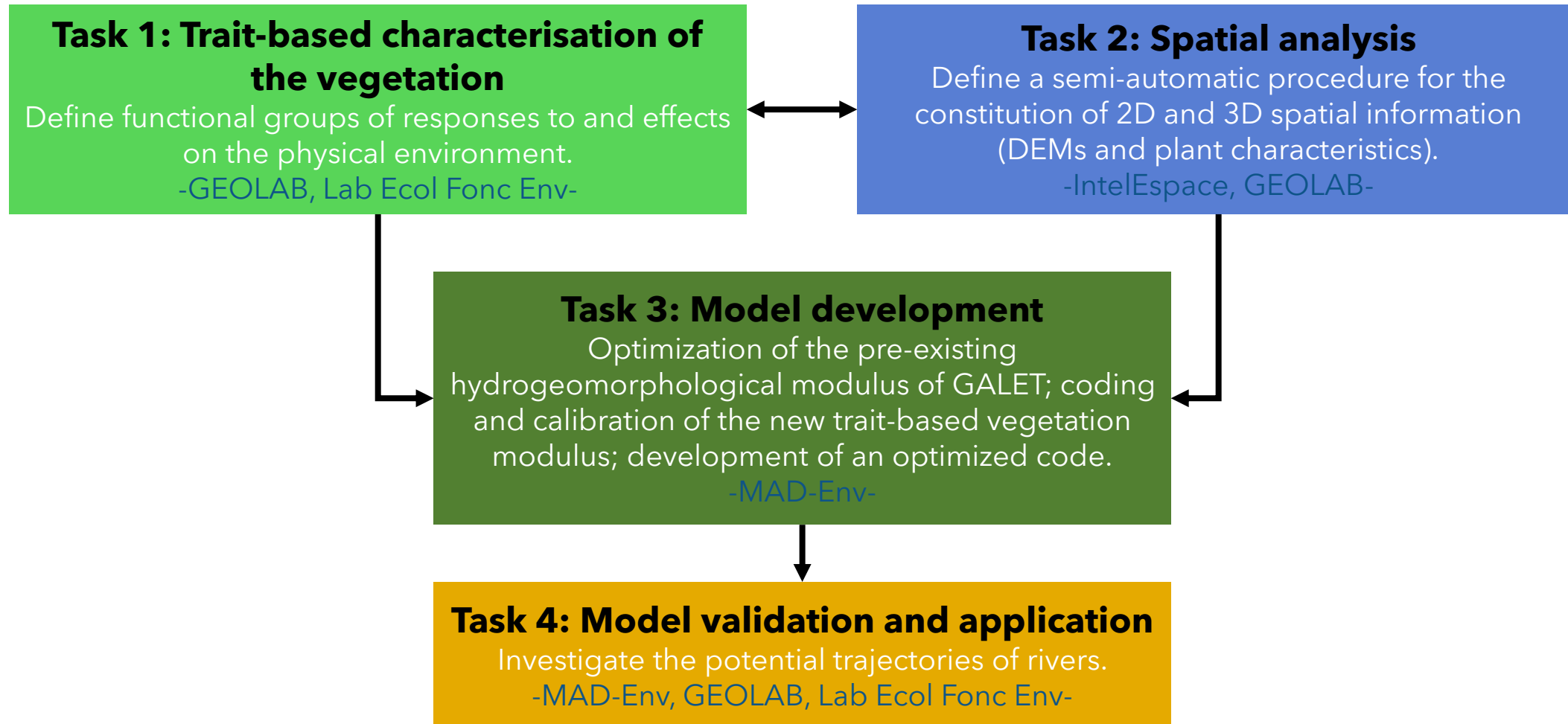


Réserve Naturelle du Val d'Allier (France)



- Succession phases / Phases de succession**
- **WA:** Water / *eau*
 - **BS:** Bare soil / *sol nu*
 - **PP:** Pioneer phase / *phase pionnière*
 - **HP:** Herb phase / *phase herbacée*
 - **SP:** Shrub phase / *phase arbustive*
 - **FP:** Forest phase / *phase arborée*
 - **AGRI:** Agricultural land / *terrain agricole*

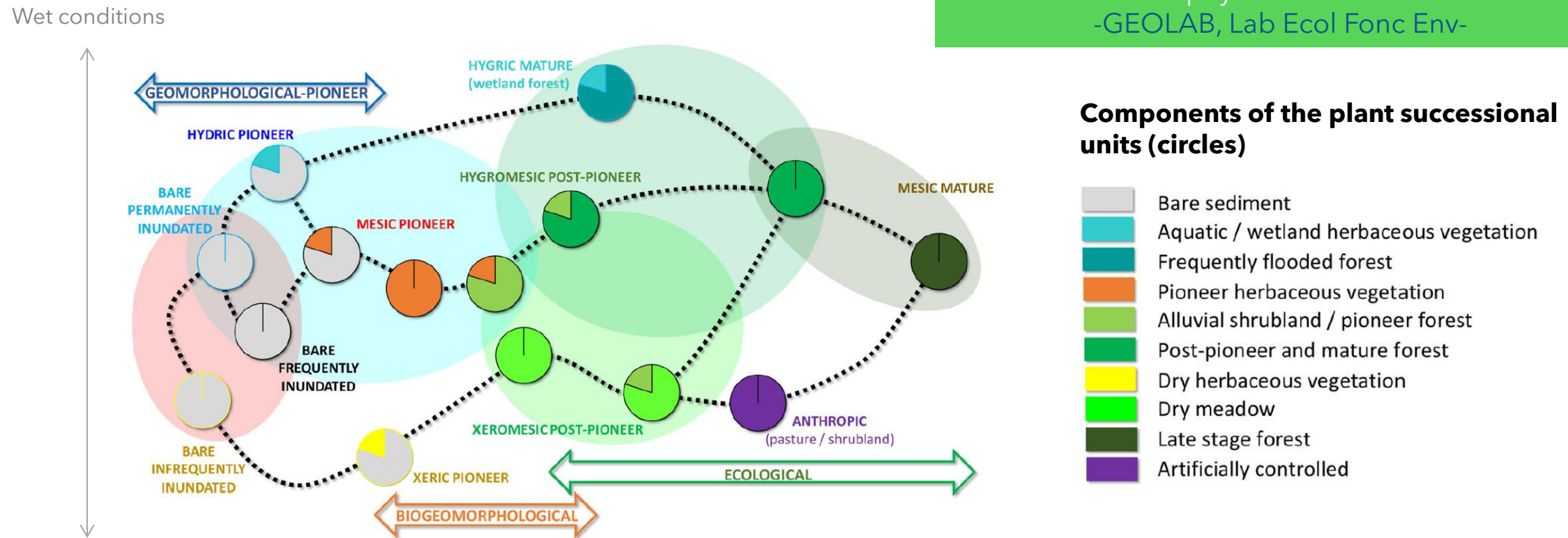


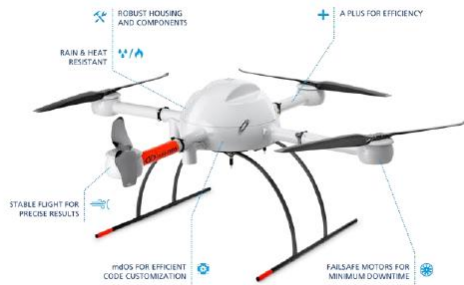


- A functional trait approach will be followed.

Task 1: Trait-based characterisation of the vegetation

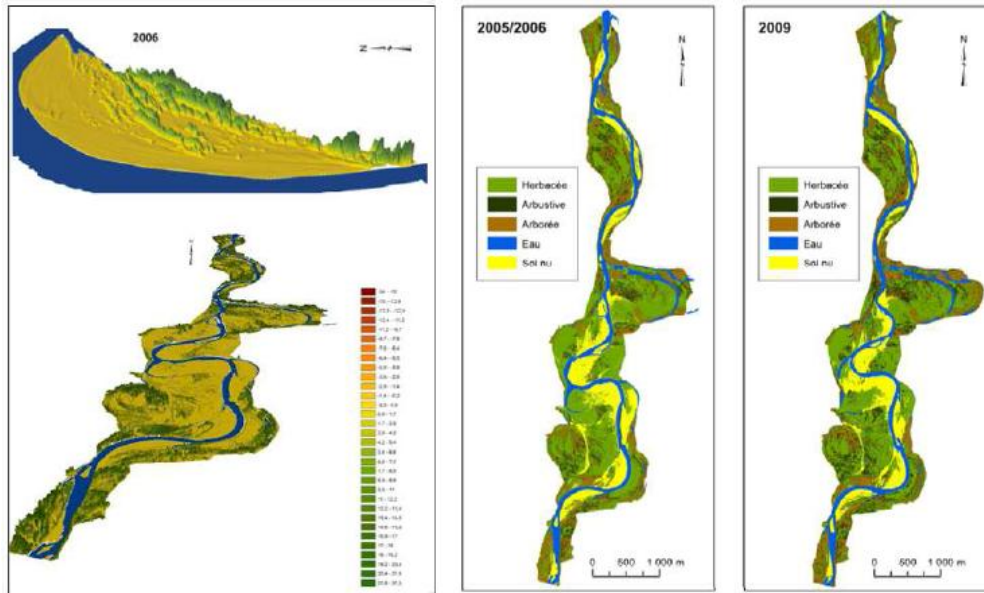
Define functional groups of responses to and effects on the physical environment.
 -GEOLAB, Lab Ecol Fonc Env-





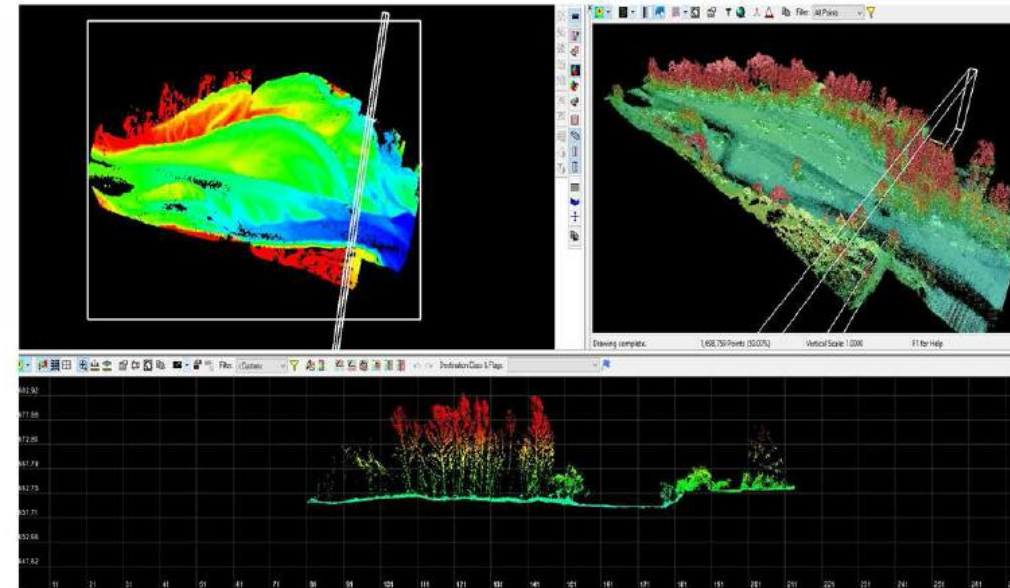
Task 2: Spatial analysis
 Define a semi-automatic procedure for the constitution of 2D and 3D spatial information (DEMs and plant characteristics).
 -IntelEspace, GEOLAB-

Diachronic reconstitution (aerial images)



Hortogágyi, 2014

LiDAR 3D data acquired by drone

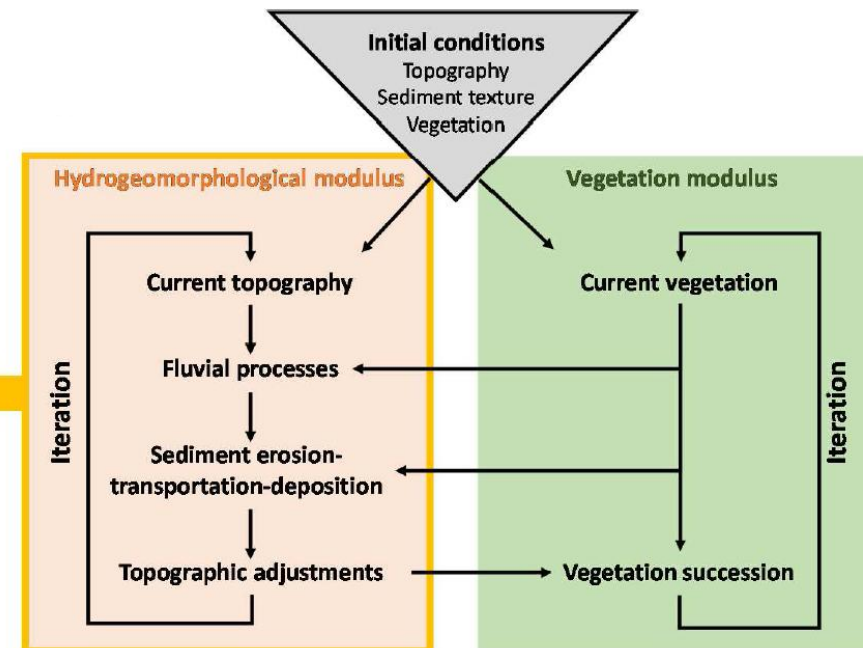
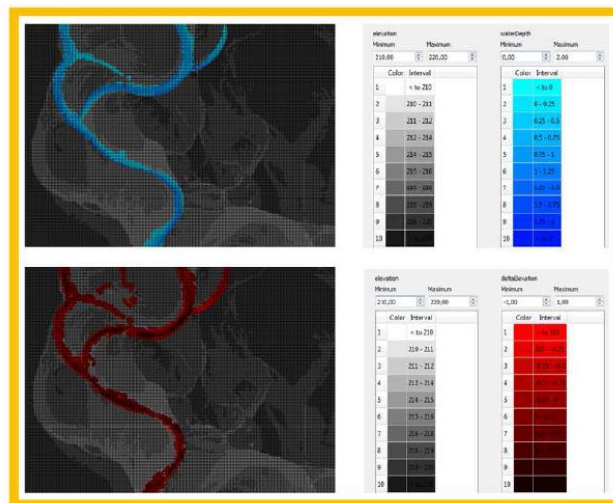


MSH-IntelEspace

- Inputs from Tasks 1 and 2.
- Flow model (LISFLOOD).
- Sediment model (adapted from CAESAR).
- Vegetation (new module).
- Cellular automaton.

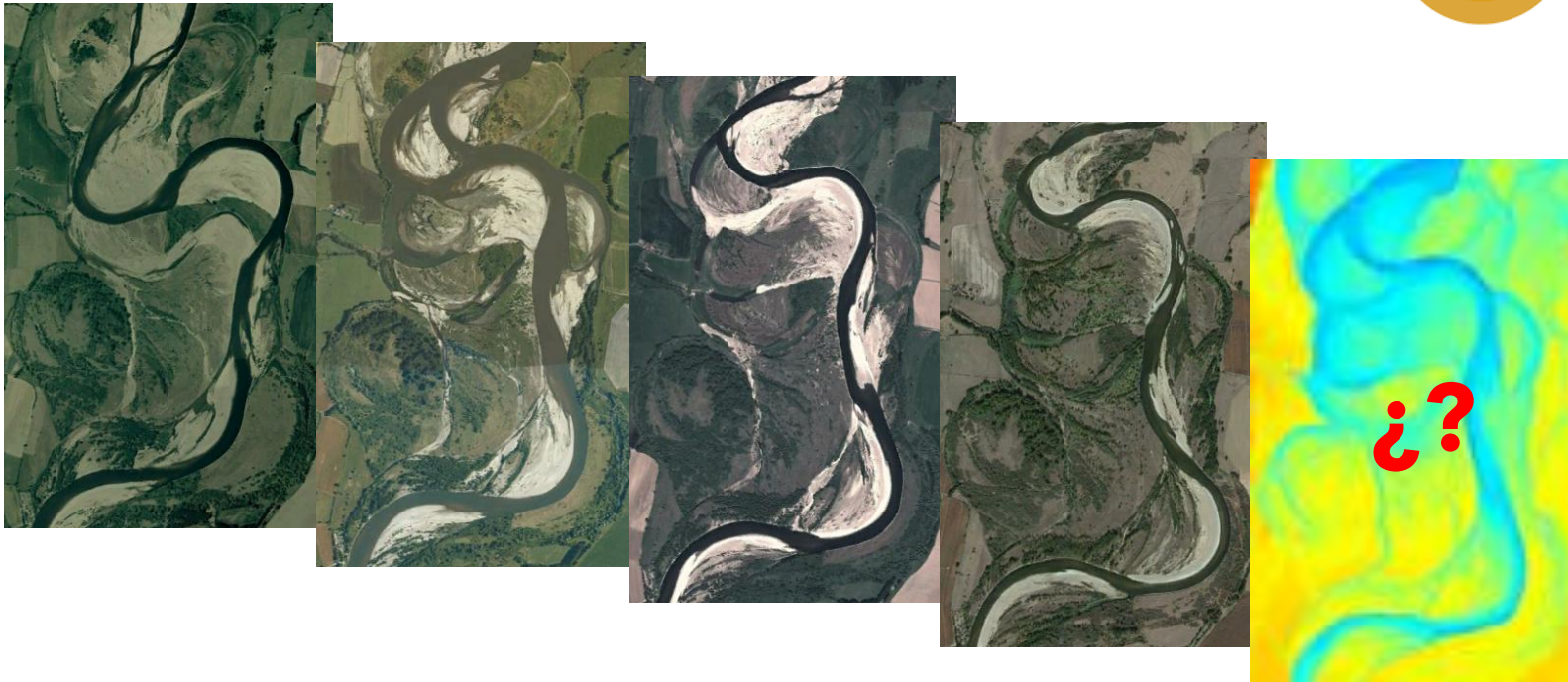
Task 3: Model development
 Optimization of the pre-existing hydrogeomorphological modulus of GALET; coding and calibration of the new trait-based vegetation modulus; development of an optimized code.
 -MAD-Env-

2D maps of dynamic variables



- Sensitivity analyses.
- Research tool in river science.
- Decision support system for river managers.
- Simulation of different scenarios.

Future evolutionary trajectories of the fluvial corridor?



Task 4: Model validation and application

Investigate the potential trajectories of rivers.

-MAD-Env, GEOLAB, Lab Ecol Fonc Env-



UNITED NATIONS DECADE ON
**ECOSYSTEM
RESTORATION**
2021-2030

Thank you very much for your attention!



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Latest news of the project:



GEOLAB

Laboratoire de Géographie Physique et Environnementale

<https://geolab.uca.fr>

ResearchGate

Project

ANR project NUMRIP: Trait-based numerical modelling of feedbacks between river morphodynamics and riparian vegetation

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