

Eco-morphodynamics of Coastal Dunes

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1.Context

Coastal Dunes are ecotones with an extraordinary floristic and faunistic **biodiversity**, they play a key role in coastal **sediment balance** and act as a physical **barrier** against strong onshore **wind** and marine **hazards**.

WorldwideDifferently from other types, the life of **Coastal Dunes** primarily depends on **Vegetation** as it **traps** aeolian sand and **stabilize** it with the roots.

Worldwide, **70%** of sandy beaches are subject to **coastal erosion** and **Anthropic Pressures**, leading to severe a **loss** of **Dune** ecosystems.

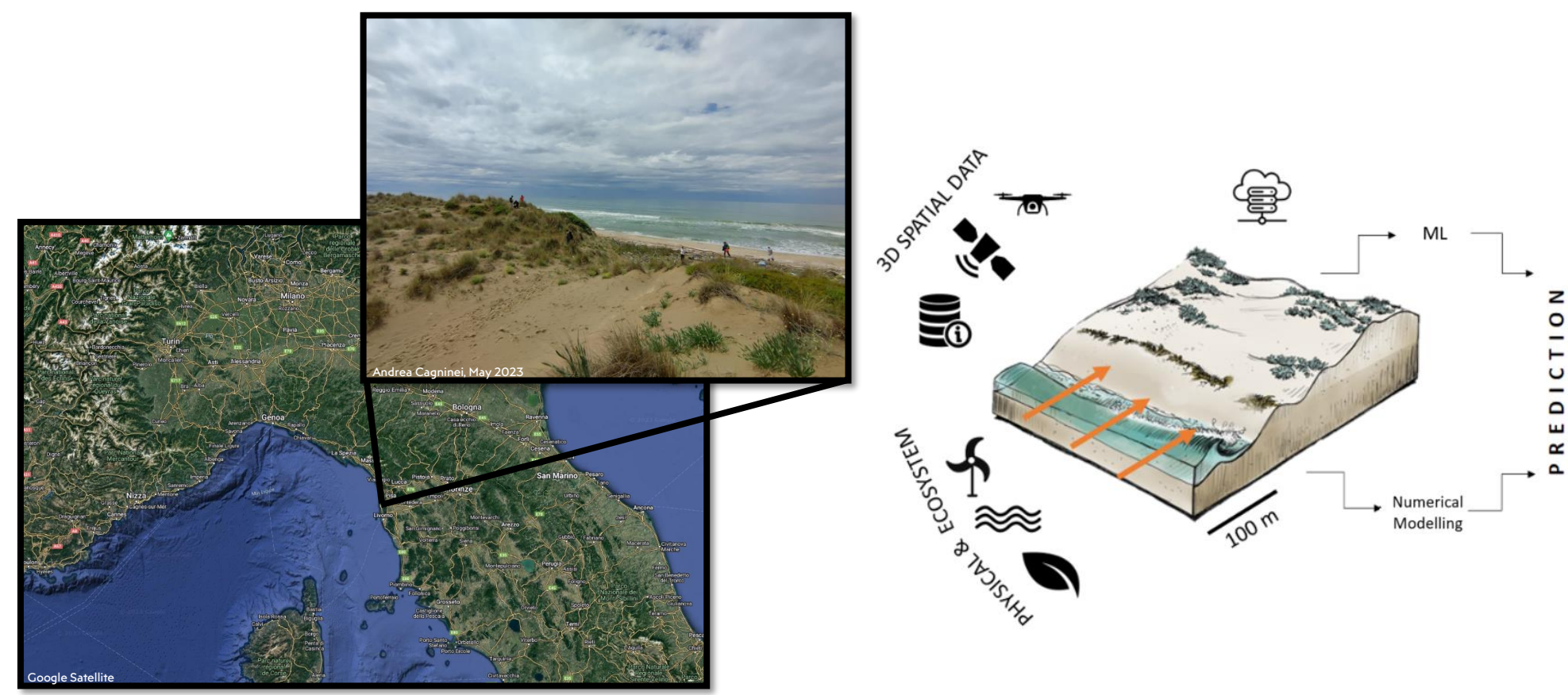
The **comprehension** and **modelling** of the complex interaction between biotic and abiotic processes for **RESTORATION** and **CONSERVATION** of **Coastal Dunes** is still at its beginning.

2.Objective

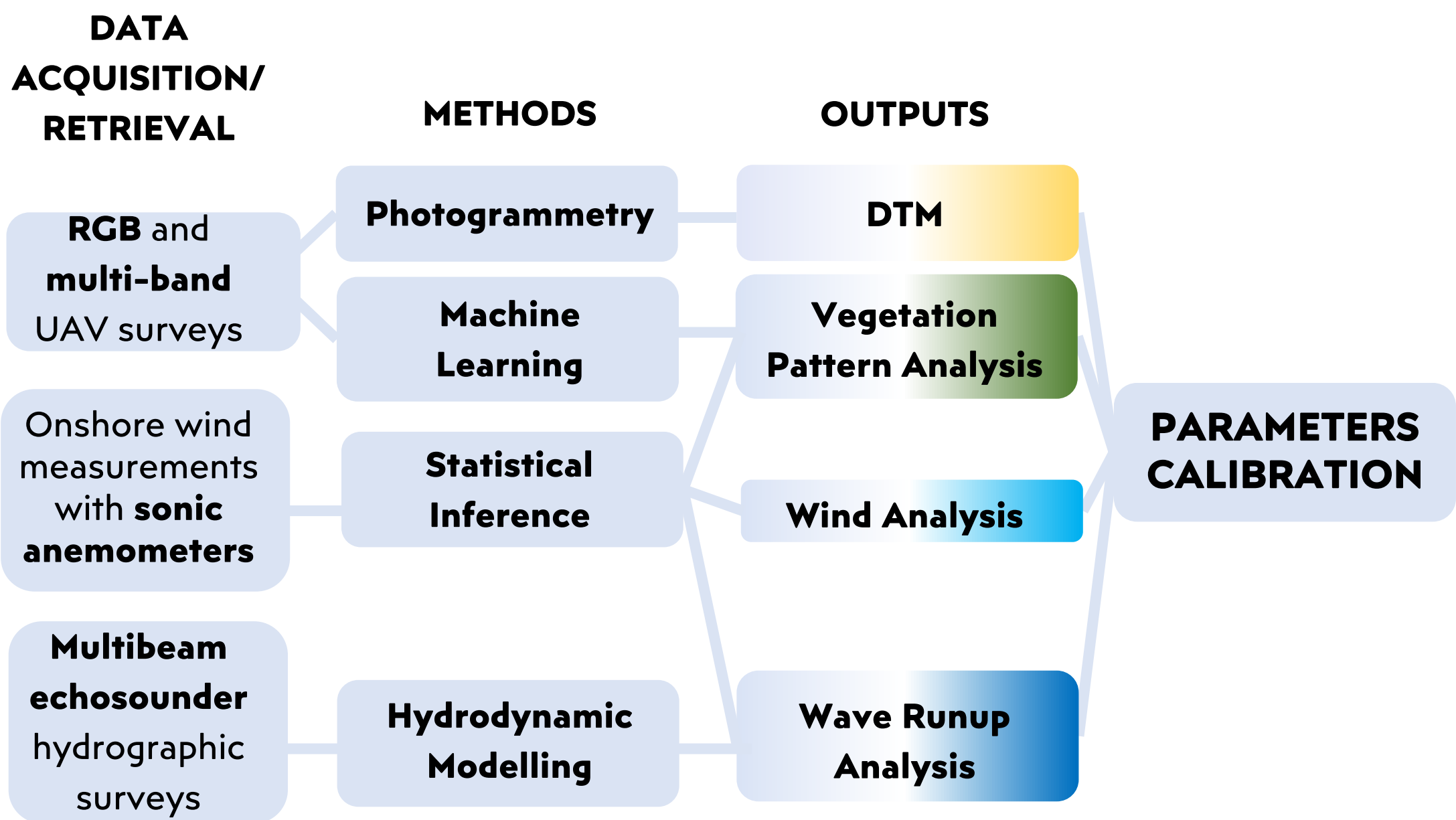
A new **stochastic Eco-morphodynamical model** is proposed to describe the evolution of the **dimensionless vegetation cover**, ψ (i.e., vegetation per unit area), under environmental forcings: **wind**, **flooding**, **sand transport**, **salt spray**, **inter/intra-species competition**.

Each forcing described in the model has a characteristic **parameter** (e.g., $\alpha_1, \alpha_2, l_{r,c}$, ...) that needs to be **calibrated** through experimental observations of the **vegetation distribution**.

$$\frac{d\psi}{dt} = f(\text{WIND, TIDES/WAVES, SAND TRANSPORT, VEGETATION INTERACTION})$$

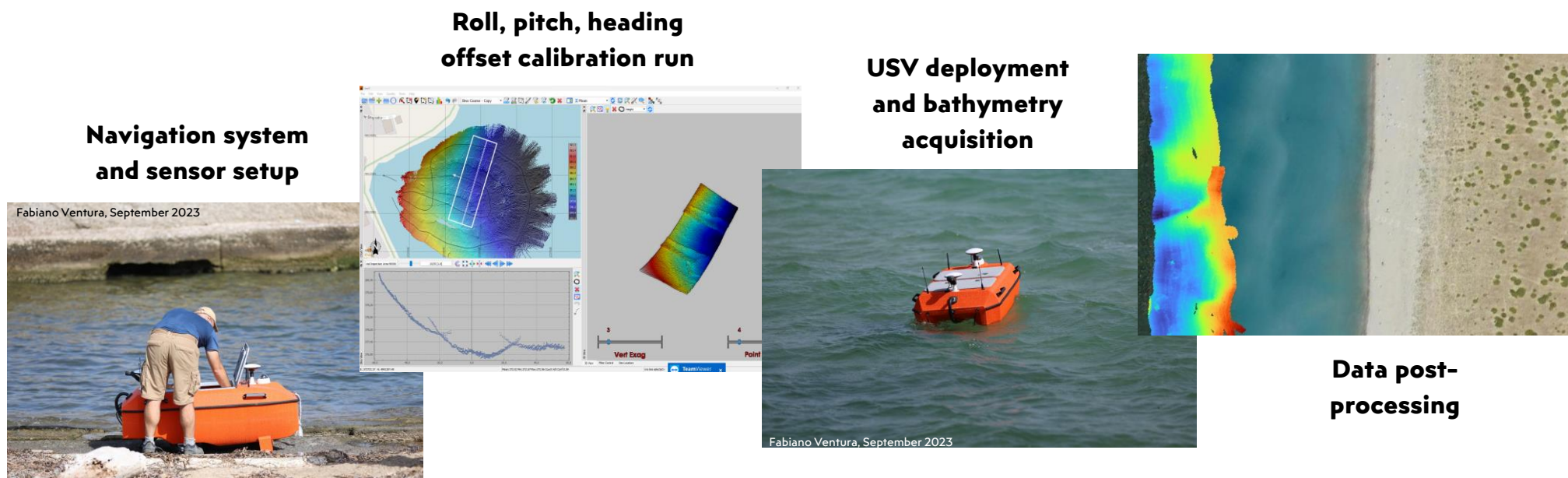
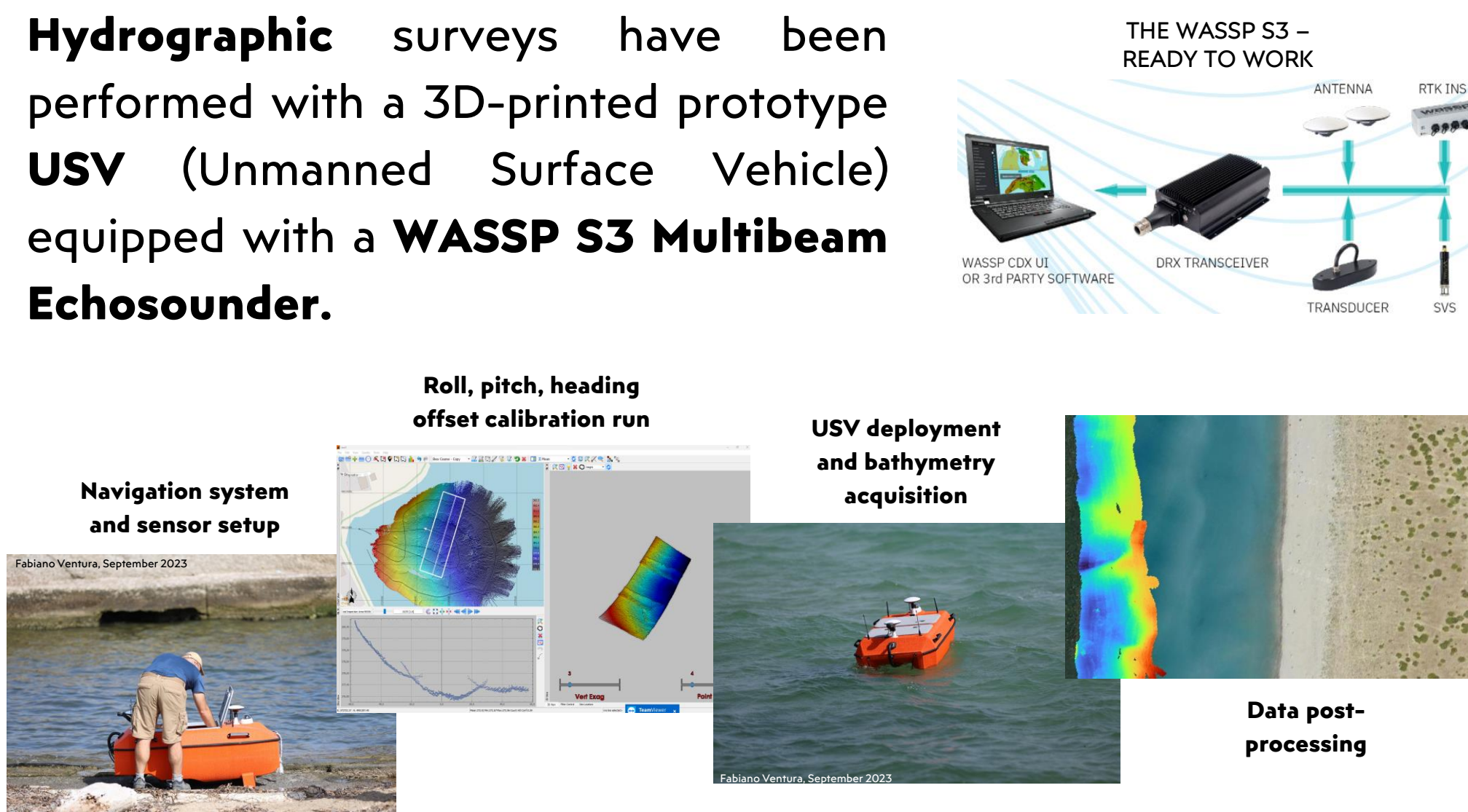


3. Methods



4.Multibeam Echosounder Hydrographic Surveys

Hydrographic surveys have been performed with a 3D-printed prototype **USV** (Unmanned Surface Vehicle) equipped with a **WASSP S3 Multibeam Echosounder**.



5.Results...so far

Wind

Wind Speed Distribution

