

Study of the hydrodynamics of a lagoon with a new kind of drifter

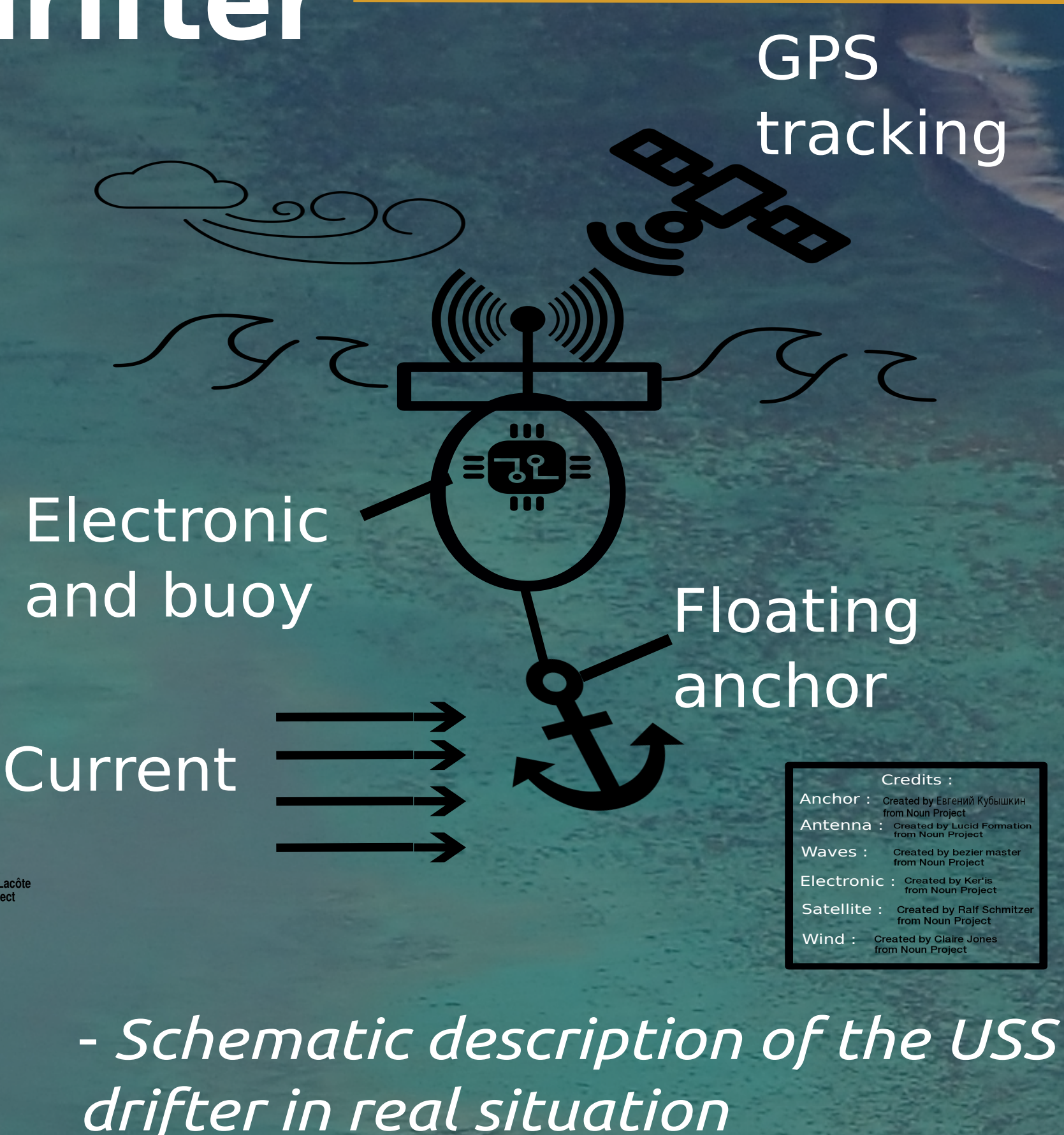
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Context

Most of the interesting phenomena in oceanography happen away from any laboratory. They even happen in locations where local conditions can be very harsh and possibility to repair instruments very limited. Examples of such conditions are lagoons on isolated Pacific islands, such as the one studied during the *UECOCOT campaign*. This is where the adventure of the *USS (Unité de Suivi Spatial)* project begins.

The USS drifter

- Cheap
- Easy to operate
- Easy to repair
- GPS precise
- Possibility to add sensors
- Robust



UECOCOT campaign

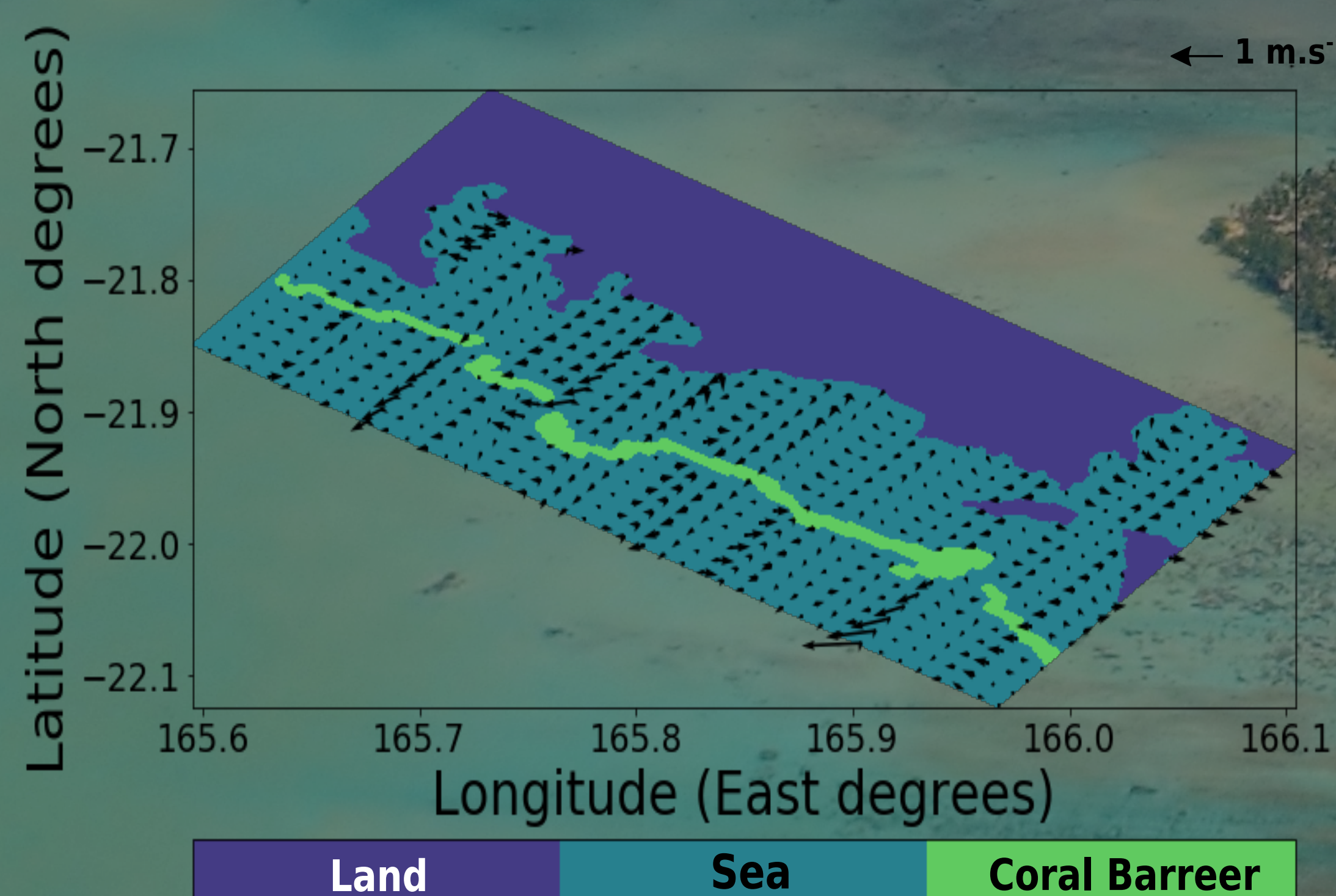
UECOCOT (*Usines, économie, société et contamination des eaux côtières*) campaign took place in the *North of New-Caledonia, in the Kone Lagoon*. Its goal was to study the impacts of the nearby nickel mine and refinery on the lagoon biodiversity.

To correctly assess this impact, an important part of the team focused on the *hydrodynamics of the lagoon*. This focus is mainly due to the presence of a *coral barrier reef* between the ocean and the lagoon, whose presence gives rise to an important oceanic wave breaking.

This creates important *fluxes of water* which modify the hydrodynamic circulation in the lagoon.

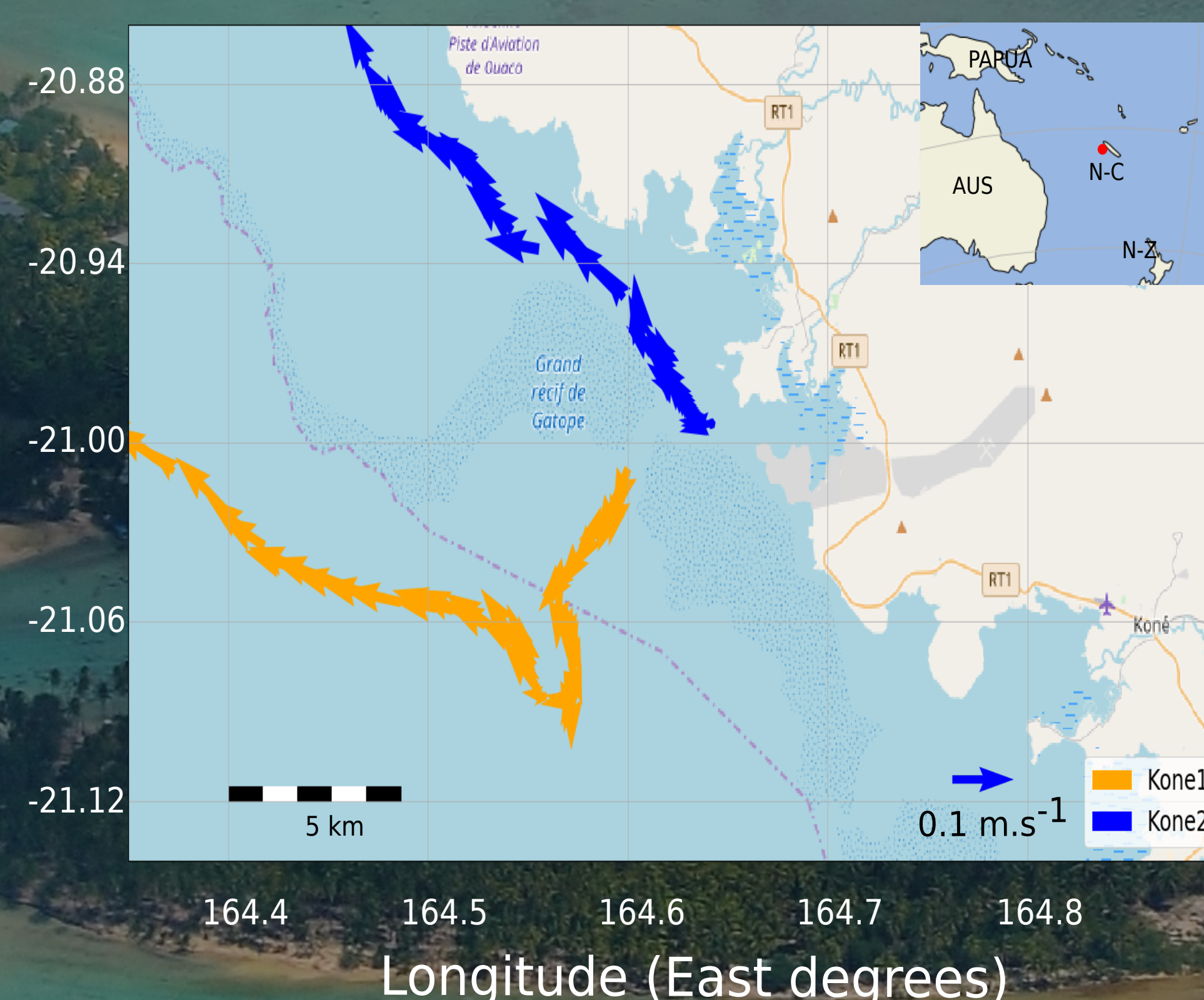
Hydrodynamics investigation tools

Coastal circulation have already been widely studied, with many different kinds of sensors. Measurements were mainly *eulerian ones*, with fixed *current and pressure sensors* (Sous et al, 2017) or *high frequency radars* (Devenon et al, 1990). *Lagrangian measurements* like the USS project have been realized before (Mantovanelli et al, 2011). Finally, one has to talk about *circulation models* like CROCO (*Coastal and Regional Ocean Community model*), which allow us to use the in-situ measurements to get an insight of the overall circulation of a zone.



- Computed zonal speed from the CROCO model in the Ouano lagoon (personnal work, not published yet).

First results



- First velocity measurements derived from positions of the two prototypes (Kone 1 and 2) during the UECOCOT Campaign

- USS was operated *several times with success*
- *Out-flowing surface current* was observed during the flux in the main pass
- *North directed surface current* was observed in the lagoon
- Possible effect of the *cross-reef water fluxes* or of freshwater fluxes from the land
- To be compared with moored data and model outputs

What is next ?

- Data from moored current sensors must be retrieved in May 2018 and compared with data obtained from USS drifters
- *Circulation models* are being developed at MIO to study lagoon hydrodynamics
- Those data may be included in the models using *inverse modelling and data assimilation methods*
- A new entirely *open-source prototype of drifter* is ready for in-situ test phase