

The Argonauts and the Golden Fleet

A modern journey to recover the argo floats at-sea

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Jcommopos receive a message from the oracles :
Something must be done to recover the argo floats.

The Ericus erudites imagine a first journey
toward this objective.

Skravikis sailors accept the quest
to find the golden fleet.

Sinking of failed Argo floats represent a consequent issue both for the important loss of high-tech devices and for the environmental impact this waste may have. With 3942 active floats in early 2020 and almost 800 deployed each year, reducing this loss is a challenging project.

To explore the implementation of dedicated campaigns we 1) propose two approaches to target the best recovery timing, 2) present a practical case in North Western mediterranean basin and compare the setup with a motor and with a sailing research vessel, and 3) highlight two technical tools essential to the success of such mission.

Sources :  

2) Practical Case

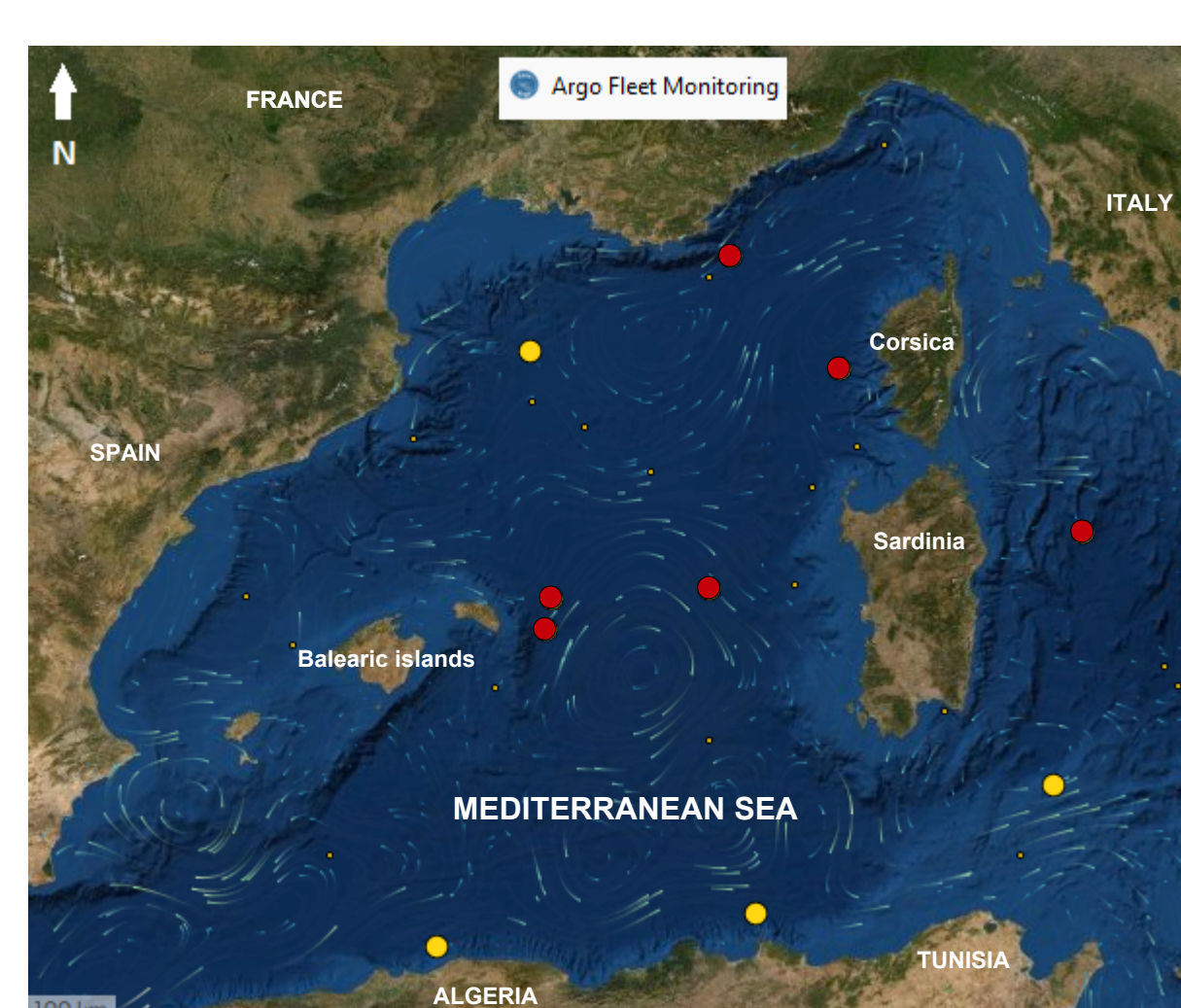


Figure 2. Floats deployed in 2016 and 2017 in the western mediterranean basin. We target six floats (in red) concentrated in the northern part of the zone.

We present a concrete campaign project to recover six floats, having made more than 119 cycles, geographically concentrated between the Balearic archipelago, south Sardinia, west coast of Italy and south coast of France (Figure 2).

We simulated the route of two different vessels, the motor catamaran *L'Europe* and the sailing catamaran *Oufou*. We took into account the wind and the sea conditions with a routing algorithm (see point 3 : routing). Meteorological data were downloaded on ECMWF website. L'Europe characteristics were found on the French Oceanographic Fleet website. The results are presented in the Table 1.

Table 1. Characteristics of the two catamarans and parameters of their simulated routes to recover the 6 target floats.

		
Length	29.6 m	14.5 m
Crew	8	3
Duration	4 d 6 h	6 d 22 h
Mean Speed	9 knts	6.2 knts
Engine use	100 %	7 %
Consumption	14.45 m3	0.02 m3
CO2 Emission	38 726 kg	54 kg
Cost	---	13 321 €

1) Recovery Timing

Recovering a float too early will strongly reduce the number of profiles sampled. Conversely, waiting too much increases the risk of failing and may lead to missing recovery. Therefore a recovering window may be estimated to plan the campaign and ask the float (see point 3 : communication) to stop profiling.

A- Fleet monitoring dashboard allows to continually follow different indicators from each devices. Targeting lowering battery level may be an optimized way to ajust recovery timing. However, battery monitoring is only available for Arvor and Provior floats and may not give the opportunity of great anticipation.

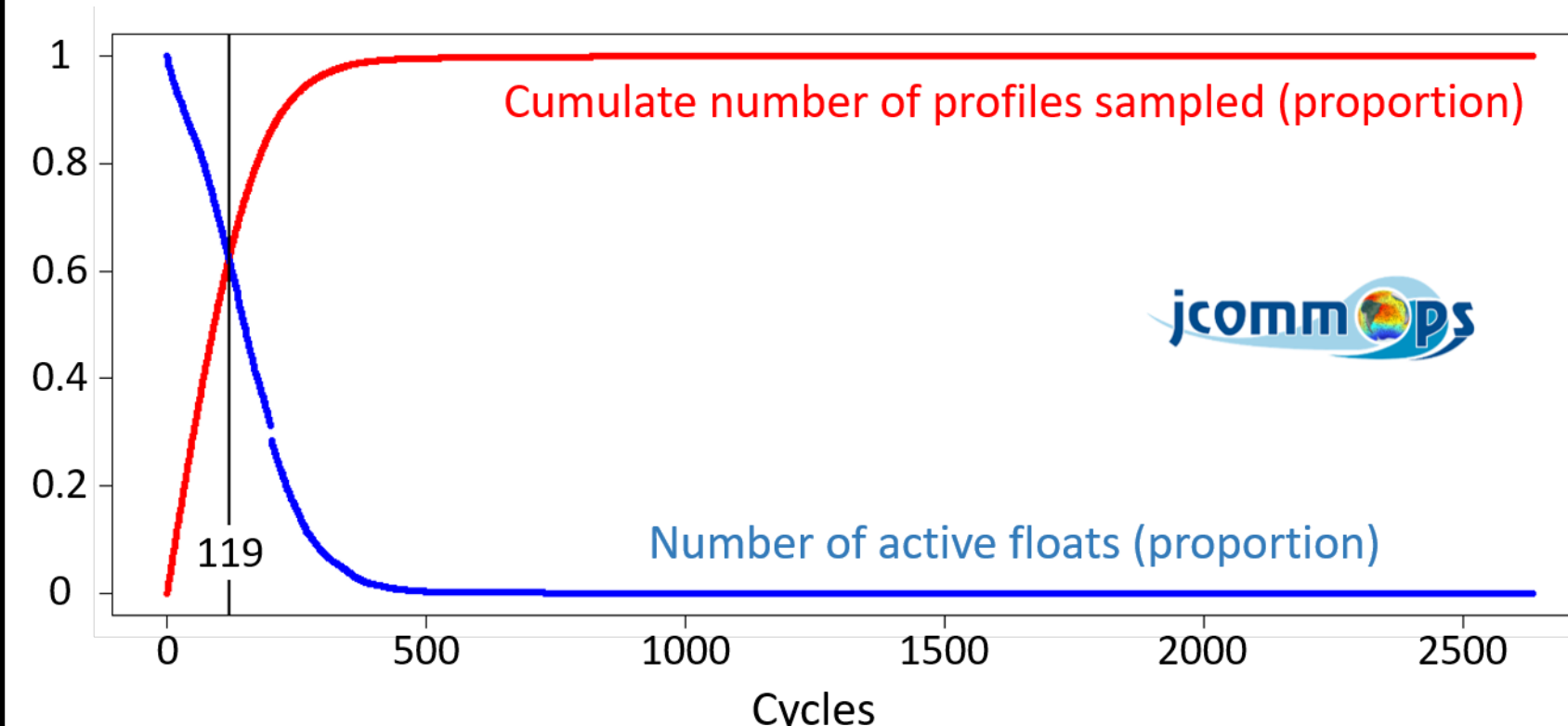


Figure 1. Estimation of a target number of cycles after which floats should be recovered

B- A target number of cycles may be estimated to maximise both the number of recovered floats and the cumulated number of profiles sampled. We estimate it to 119 (Figure 1) using the number of cycles made by the 11 612 failed profilers. With 10 days cycles, it gives a recovery target age of 3.25 years.

3) Two Essential tools

A- The Routing Algorithm :

A few days before departure, the last positions of the floats are received and routing is performed with Squid Sailing or Qtvlm softwares. These simulations provide the fastest sailing route to the floats positions, according to wind, wave and current forecasts. Once on board, the route is constantly updated with the latest positions of the floats and the latest weather information.

Here is an example of the route that could be followed for a test forecast in June (Figure 3).

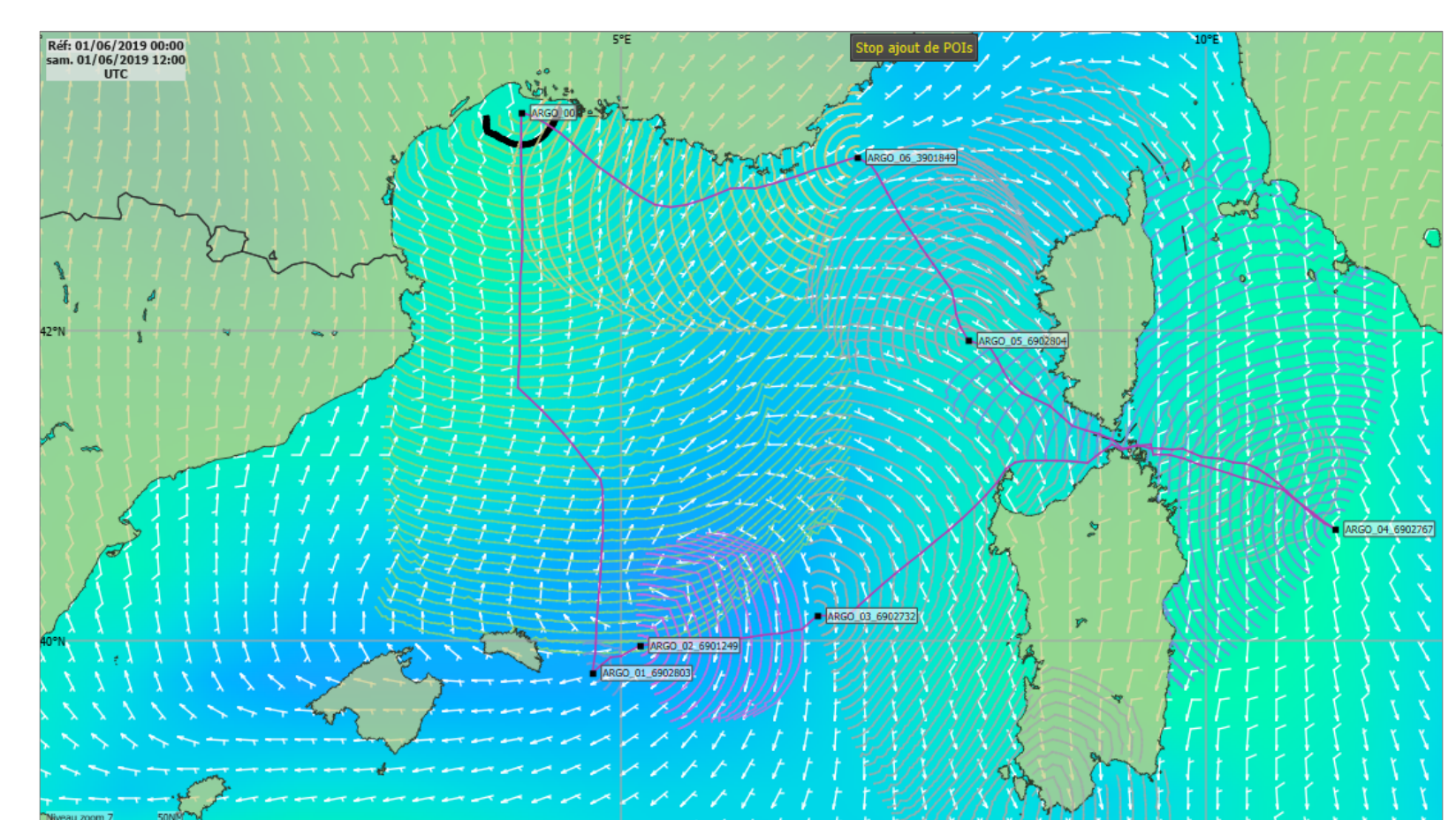


Figure 3. Fastest sailing route to recover the 6 target floats with the sailing catamaran.

B. Iridium communication :

- The Skravik team on board can download weather information and updates of the floats positions.
- The Skravik team can interact with the Argo team about their progress and next target.
- The Argo team can send orders toward the floats so that they stay on the sea surface for collection.



Figure 4. Iridium communication during a recovery campaign



The Skravik Oceanographic fleet project aims to deploy professional sailing research vessels to support marine science. The team is currently designing its operational process, within the framework of the future company.