Investigating the capability of Argo floats to monitor shallow coastal areas of the Mediterranean Sea

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# Argo floats operational monitoring in the European Marginal Seas

Strategy plan of the Euro-Argo ERIC: Expansion of Argo into European marginal seas (Euro-Argo ERIC, 2017) and provide high quality *in-situ* datasets.
Such an extension largely relies on the combined efforts of national and international Argo initiatives.

Mediterranean Sea

2001-2010

2011-2020
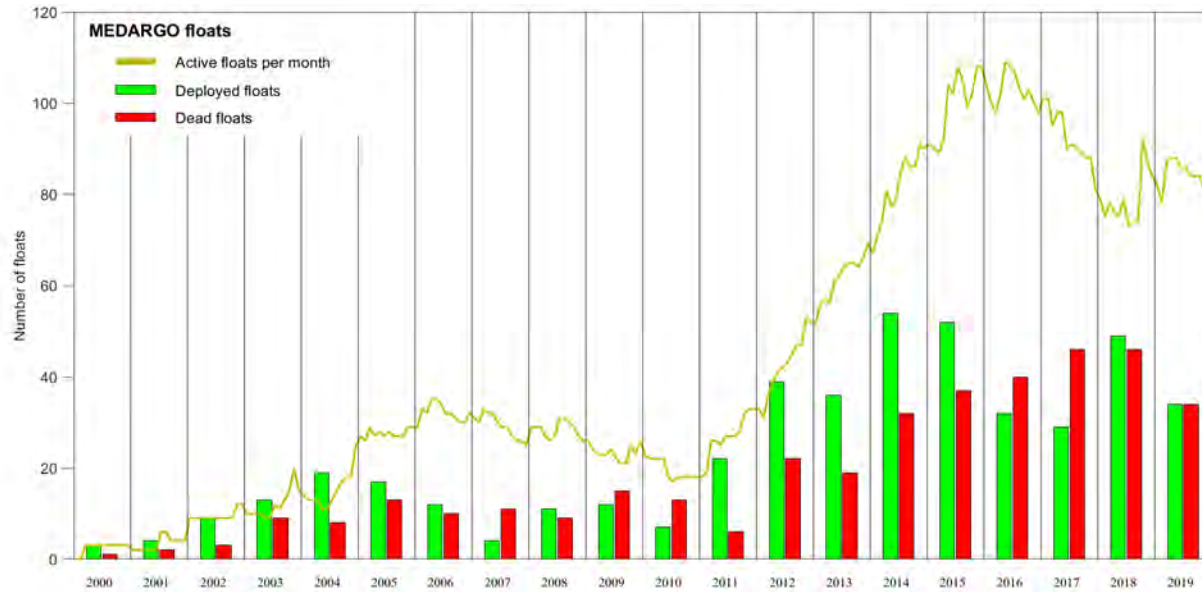
Interannual variability of float population in the Mediterranean Sea
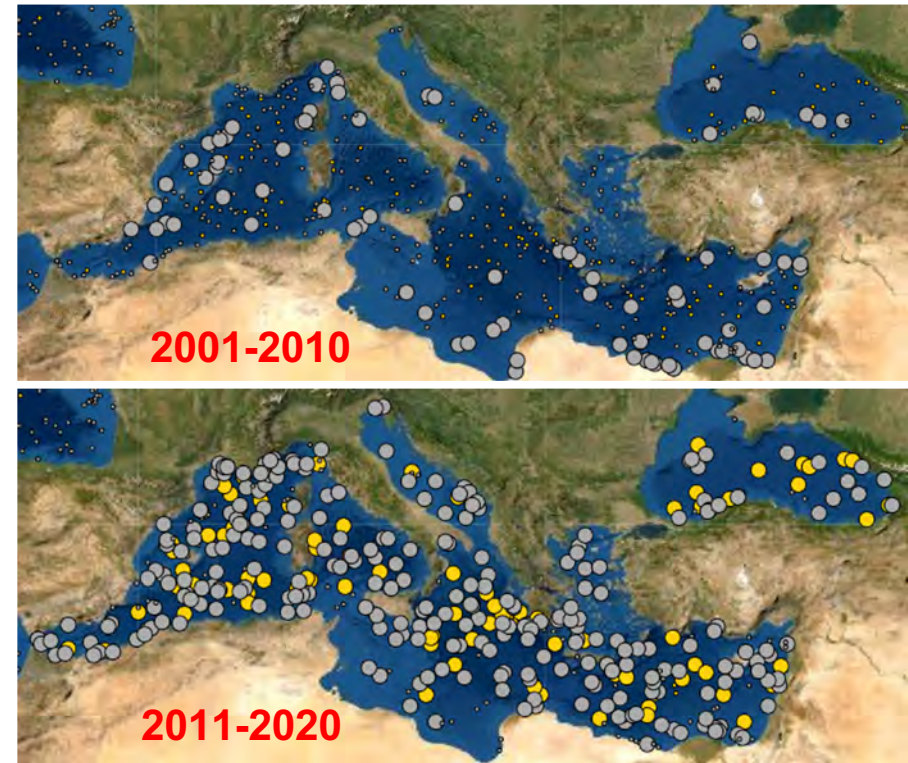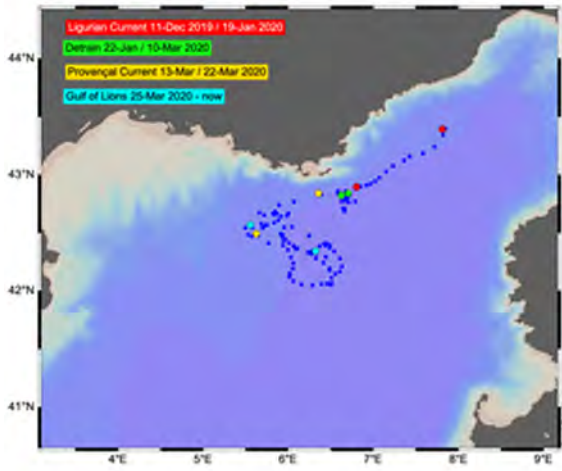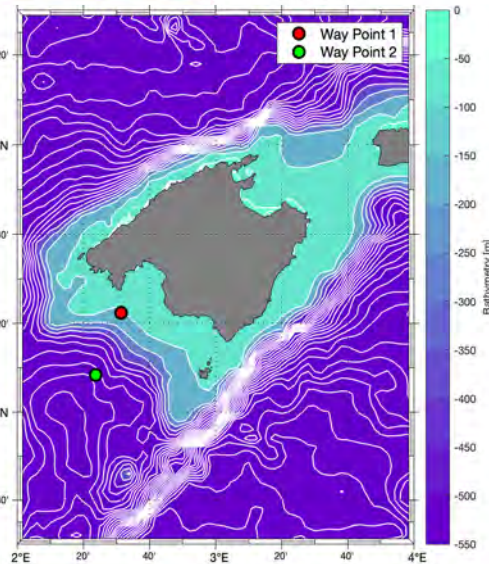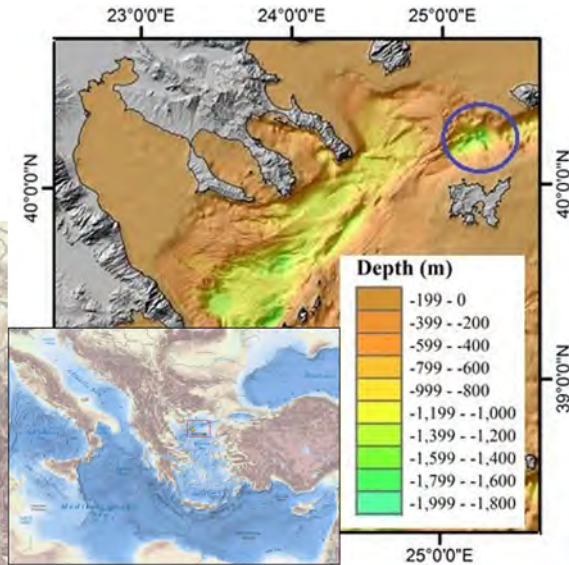
Euro-Argo RISE targeted Argo missions

- Specific Mediterranean sub-basins are scientifically important but present challenging topographic characteristics

- Euro-Argo RISE project aims to address the question whether Argo floats can adequately perform in such areas

- Test missions have been undertaken in the North Aegean, North Adriatic, Ligurian Sea, and Palma Bay
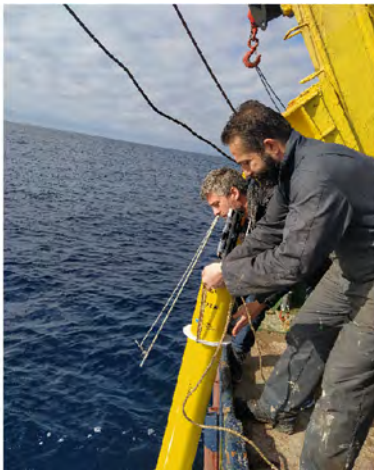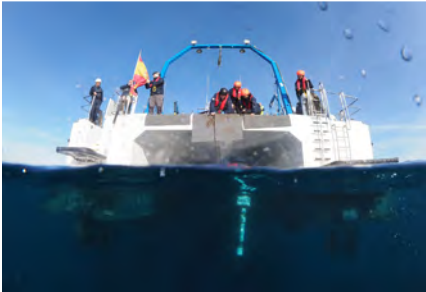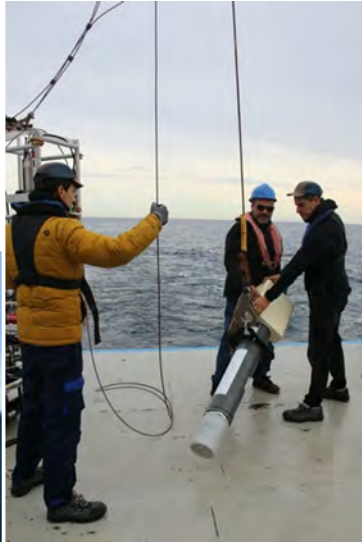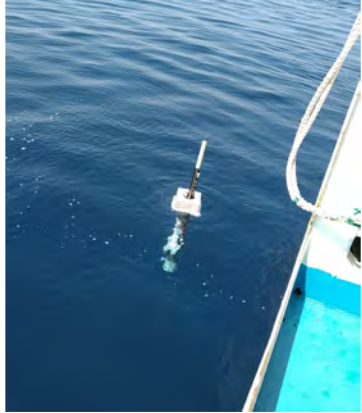
Float deployments

All floats were deployed between late-2019 and mid-2020
The floats integrated the standard CTD sensors and were equipped with the Iridium bi-directional telemetry system.
Special configuration was used according to the characteristics of each area and the target of each mission.

| Float type	WMO	Deployment date	Deployment location	Last station date	Cycles performed
APEX 11	6903288	9 February 2020	North Aegean Lat: 40.42 N, Lon: 25.42 E	5 October 2020	120
ARVOR I	6903783	31 July 2020	North Adriatic Lat: 44.05 N, Lon: 13.7 E	6 February 2021	40
PROVOR III	6902899	12 November 2019	Ligurian Sea Lat: 43.35 N, Lon 7.90 E	13 April 2021	165
ARVOR I	6901278	12 March 2020	Palma Bay Lat: 39.38 N, Lon: 2.52 E	10 April 2021	130

EuroGOOS
European Global Ocean Observing System

Floats' configuration and Monitoring

High frequency sampling and deep drifting depth was chosen in order for the floats to remain near the deployment areas

Float type	WMO	Deployment location	Cycling period	Drifting depth	Profiling depth
APEX 11	6903288	North Aegean	2 days	800 m	800 m
ARVOR I	6903783	North Adriatic	2 days => 5 days	200 m	200 m
PROVOR III	6902899	Ligurian Sea	3 days	1000 m	1000 m
ARVOR I	6901278	Palma Bay	1 day => 5 days	100 m	1000 m
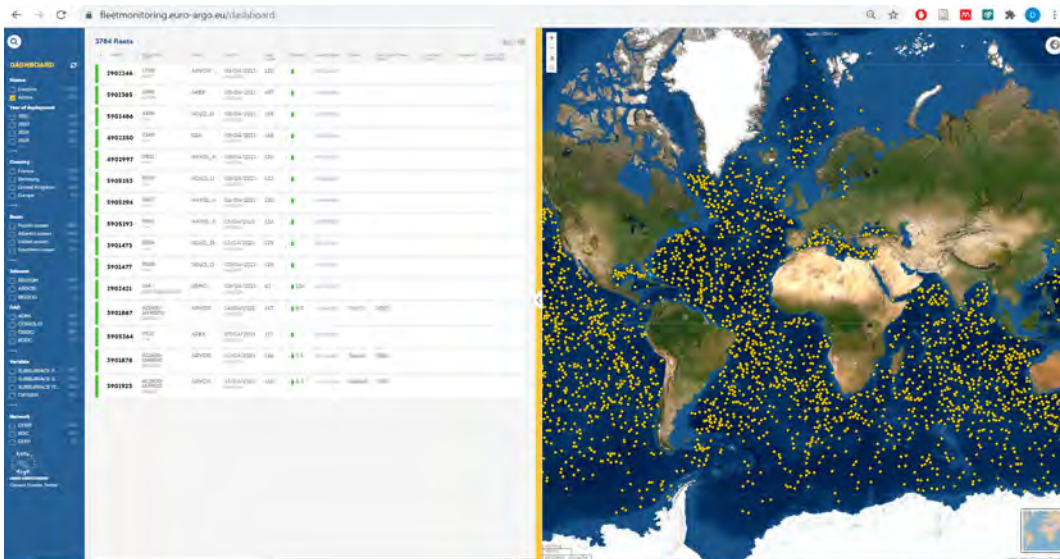
Operators monitored the floats and modified mission parameters when needed

Operational monitoring tools were used for that purpose

https://fleetmonitoring.euro-argo.eu/dashboard

Assessment of missions and results

All floats' missions were successful

Floats operated for a long time in the targeted areas (2 of the floats are still operational), providing an adequate number of good quality profiles.
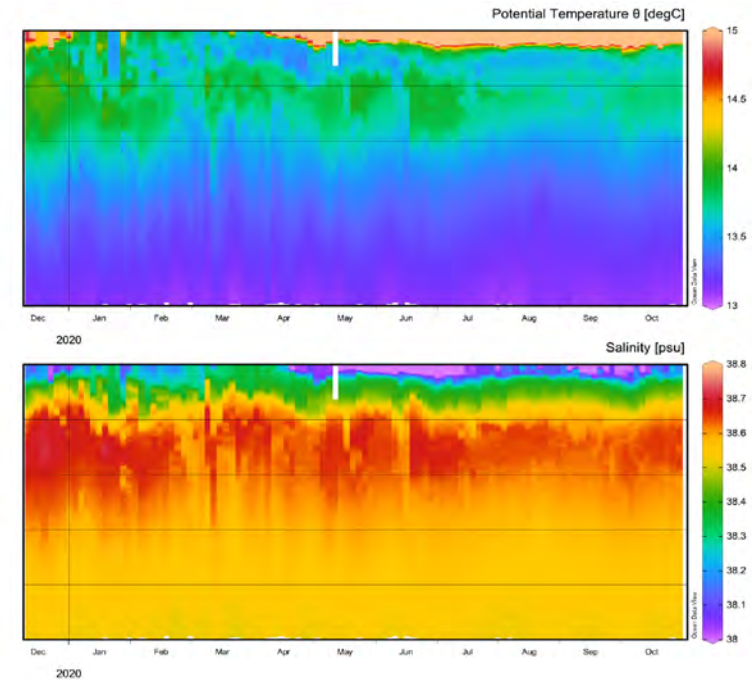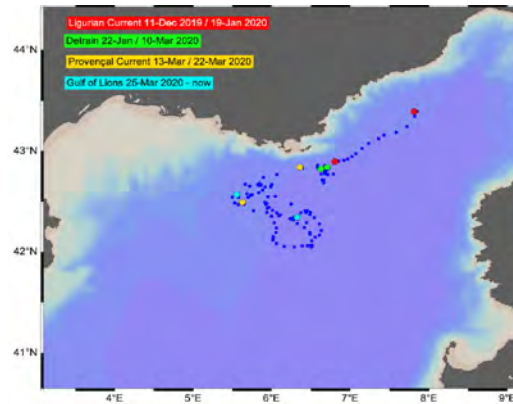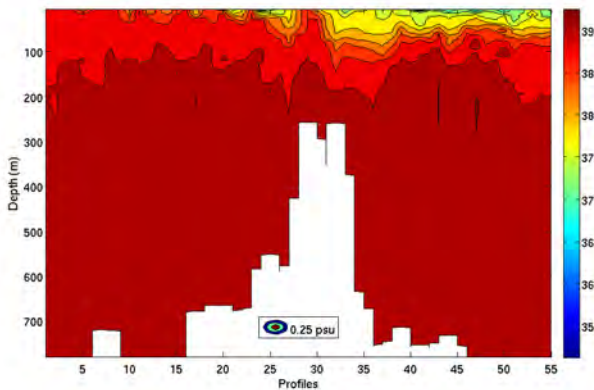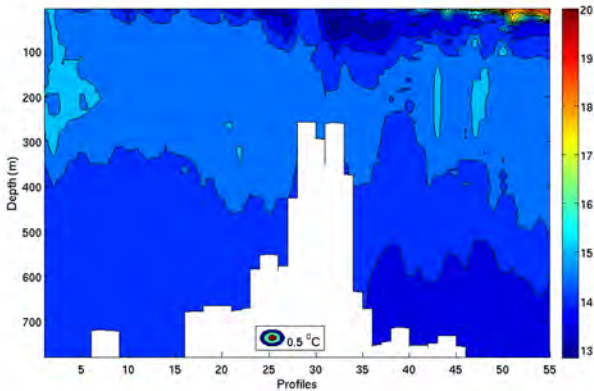
North Aegean: the float managed to sample in high frequency for 8 months providing a large number of good quality profiles for the first time in this area.
North Adriatic: the configuration used allowed the float to explore this shallow plateau

Ligurian Sea: successful choice to set the drifting depth deeper than the core of the Liguro-Provençal current
Palma Bay: strong surface currents made the float drift farther than intended. The experiment showed that the float should maintained deeper so as to stay in the area of interest.

Scientific outcomes

Ligurian Sea mission: Deep drifting depth and high frequency provided a characterization of the Liguro-Provençal current during the winter period of 2019-2020.

North Aegean mission: Strong gradients of both temperature and salinity between the eastern and the western part of the sub-basin. The colder and fresher deep water masses towards the west may reflect the result of variable DWF mechanisms in the area.
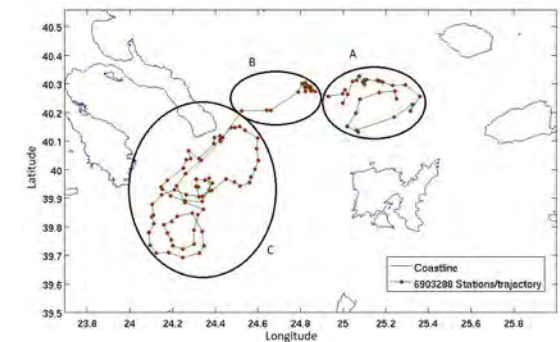
Concluding remarks

The floats managed to sample in high frequency for extended periods providing a large number of good quality profiles in some cases for the first time in these areas.

The high sampling frequency (few days cycles), and the relatively deep parking depth, prevented the floats from drifting along the coastline.

The combination of a well-planned mission configuration set up, with enhanced operational monitoring tools, can lead to significant improvements of similar missions in the near future.

This is particularly important in areas of challenging topography where the float loss rate is significantly increased.

A combination of low-cost shallow-depth-rated floats, with the increase of the floats' potential to gather more profiles, can lead to a cost effective Argo monitoring plan in such areas.

EURO-ARGO RISE

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