Submesoscale dynamics of dissolved organic matter across the Northern Mediterranean Current revealed from a new glider-mounted optical sensor

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Context

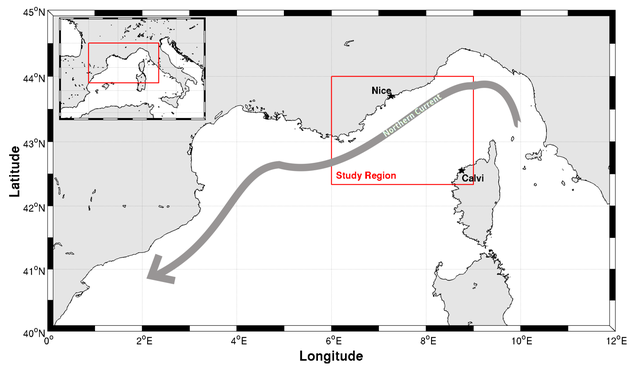
Preliminary observations using the MiniFluo-UV sensor mounted on SeaExplorer glider in the NW Mediterranean Sea.

Method

▷ Minifluo-UV

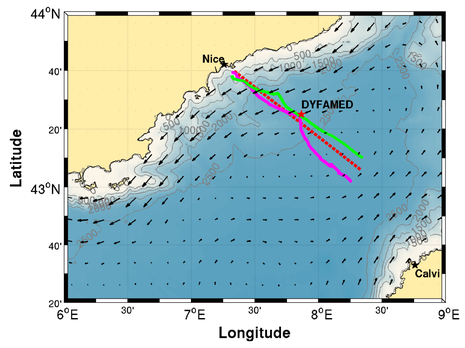
Minifluo-UV (left) with its light protection cap (middle). This glider-compatible fluorometer is capable of carrying continuous measurements of 2 fluorophores: Tryptophan (amino acid) and Phenanthrene (hydrocarbon). Many successful field campaigns were realized with the MiniFluo mounted on the *SeaExplorer* glider (right), a fairly new glider manufactured in France by Alseamar-Alcen. The glider is also equipped with a SeaBird's GPCTD and Wetlabs FLBBCD sensors.

▷ Northern current



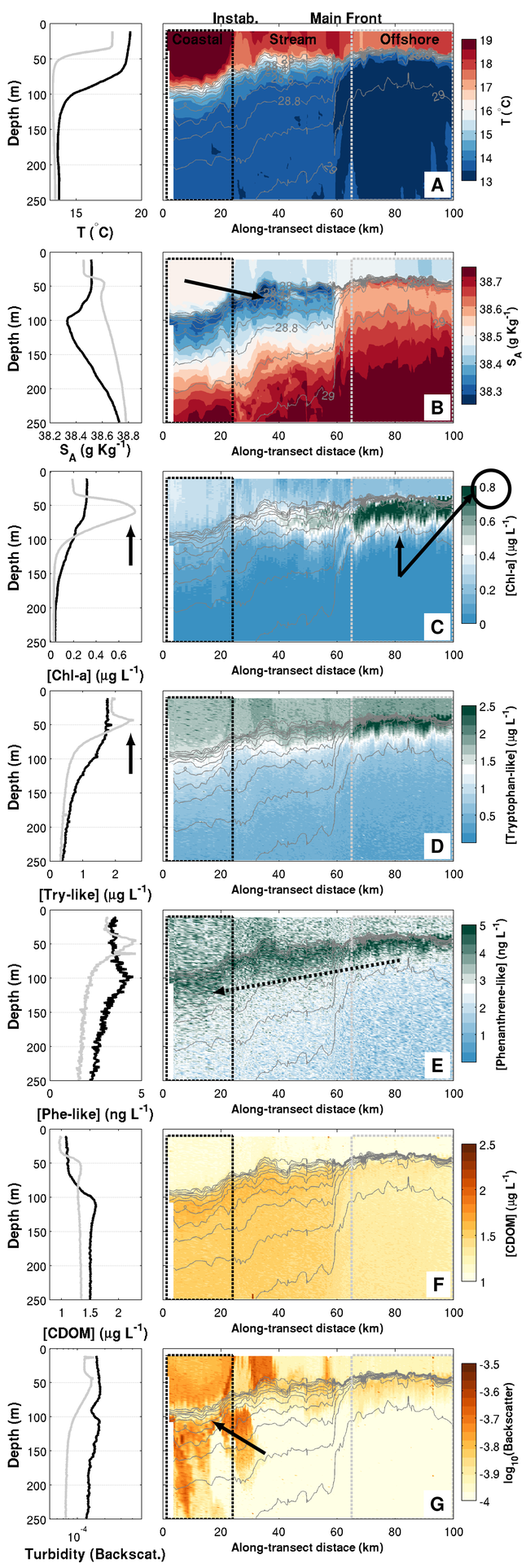
The Northern Current is a semi-permanent feature that is part of the Mediterranean Sea large-scale circulation. It is believed to act as a barrier to the transport between coastal anthropogenic zones and offshore regions.

▷ Nice-Calvi transect

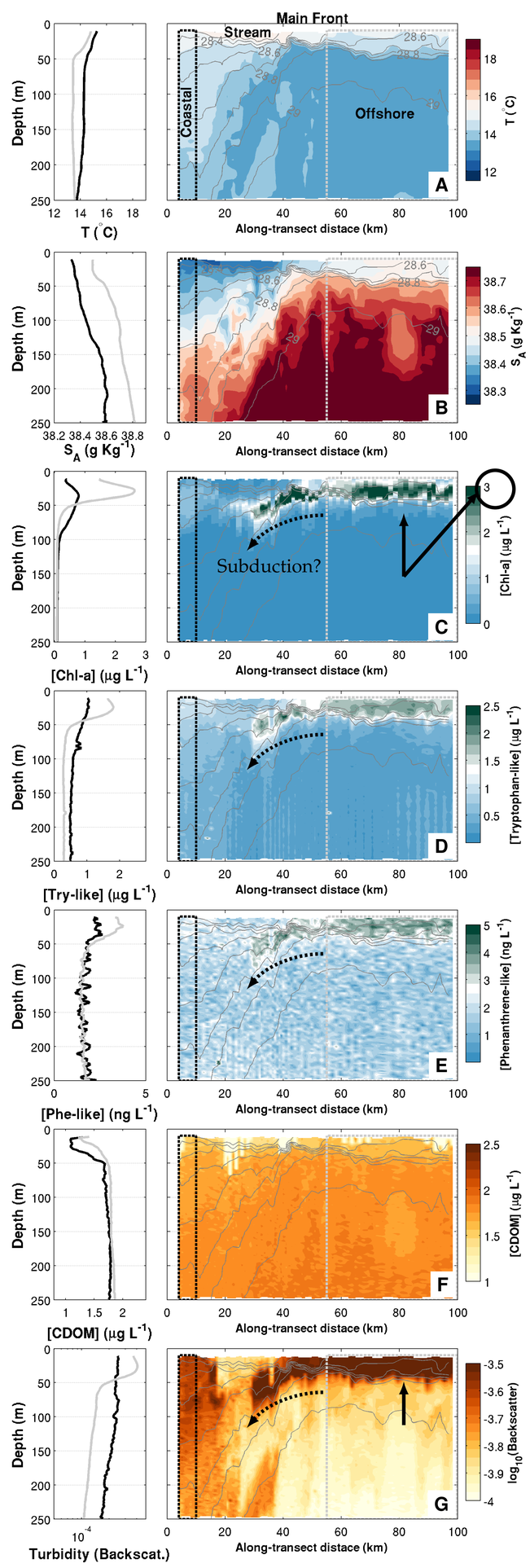


The focus is made on the NW-Mediterranean, along a portion of the Nice-Calvi transect. Data from 2 deployments (Fall 2015 and Spring 2016) are projected on the transect (dashed-red line). Currents arrows are a snapshot of AVISO data from 1 November 2015.

1. Fall 2015 (28 Oct.-4 Nov.)



2. Spring 2016 (29 Apr.-3 May)



Some relevant observations

Physical aspects

- ▷ The Northern Current is well resolved (geostrophic jet separating coastal and offshore regions), but position variable in time (Figures in row *A*).
- ▷ Fall: subsurface fresher layer near the coast of unknown origin (1*B*).
- ▷ Spring: possible subduction of biochemical tracers at the front (2*CDEG*).

Biogeochemical aspects

- ▷ Evidence of biological relationship between Chl-*a* and TRY (Figures in rows *C* and *D*).
- ▷ Chl-*a* ~3X higher in Spring (*C*), but TRY lower (*D*).
- ▷ Fall: maximum in TRY is thinner and shallower than Chl-*a* maximum (1C vs 1*D*).
- ▷ Fall: continuum of high PHE through the front (1*F*).
- ▷ Evidence of photo-bleaching of CDOM (surface and offshore) in Fall (1*F*), while high CDOM content in Spring is likely related to recent winter mixing (2*F*).
- ▷ Fall: more turbid waters are trapped to the coast except for the subsurface fresher layer (1*G*).
- ▷ Spring: strong back-scattering near the surface marks high CHL-*a* content (2*G*).

Future research questions

- ▷ What is the role of cross-frontal exchanges of DOM?
- ▷ What is the origin of the intermediate lower-salinity layer?
- ▷ Does the increase in TRY-like concentration in the Fall reflects changes towards more heterotrophic communities?
- ▷ Does the vertical shift between CHL/TRY maxima relates to the vertical distribution of microbial communities?

→ I also develop tools for SeaExplorer data processing and would be happy to discuss with anyone using gliders

Acknowledgments

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