1 Upwelling filaments

- Upwelling filaments — narrow, elongated structures of cold water extending offshore in the ocean upper layers (Figure 1).
- They deserve a particular attention because of their role in the offshore exportation of nutrients.
- Their mechanism(s) of generation are not perfectly understood.
- The filament we have studied lies off Cape Ghir (31°3‘W, Morocco).

2 CAIBEX—Cape Ghir

Canaries-Berberian marine ecosystem exchanges cruise off Cape Ghir:
- Abord R/V "Sarmiento de Gamboa"
- From August 16 to September 3, 2009.
- Data: CTD, SeaSoar, drifting buoys and ADCP velocities.

3 Structure of the filament

3.1 Horizontal maps

At 4.5 m: cool water along the coast — upwelling. offshore extension of upwelled — filament, warmer area south to 30°40’N — wind-shelter.

At 25 m: the filament appears as an elongated structure with a mean latitude corresponding to that of Cape Ghir. The persistence of the filament throughout the three week observation period is reflected in the strong signal in the mean.

At 300 m: structure of relatively warm water, centred at 31°N and close to the coast.

3.2 Vertical sections

Temperature: filament between stations T1 and T10.

Salinity: signal of the filament not identified.

Chlorophyll-a: highest values at 25 m. T & S: downwelling of the isotherms and isolines below 200 m between T1 and T10 — vertical velocity?

3.3 ADCP velocities

Surface layer (0–25 m): max. velocity = 0.55 m s⁻¹ at 30°40’N. South of 30°30’N: flow directed toward the coast (v ≤ 0.15 m s⁻¹).

250–350 m: north-eastward velocities in the southern part of the transect.

Negative shear between T1 and T10 — anticyclonic eddy?

SeaSoar transects, 0–25 m: highest velocities in transects 1 and 4. Current main westward.

3.4 Drifters

First 10–15 days: weak displacements (calm winds).

After 15 days: north-westward motion for drifters 95854, 95855 and 95867 — entrainment by the filament.

Between 31°N and 31°30’N: cyclonic trajectory then south-westward motion. Median velocity ≈ 0.35 m s⁻¹.

300 m-drogue drifter (95864): cyclonic lope; period T ≈ 5.6 days; radius R = 25–30 km, median velocity v ≈ 0.25 m s⁻¹.

4 Conclusions & future work

The main features occurring off Cape Ghir in summer:
1. the coastal upwelling, with a width of 50 km and minimal surface temperature of 16°C;
2. the filament, with an extension on the order of 100 km, a depth of 50 m and surface temperature up to 4°C lower than the open-ocean water at the same latitude;
3. the warm subsurface anticyclonic eddy, located north of the filament, at depth between 200 and 400 m;
4. the wind-sheltered area south of Cape Ghir, where the coastline undergoes a change of concavity.

Future work:
- Confirm the existence of the subsurface anticyclonic eddy and its interaction with the filament.
- Compare with observations of other cruises in the same area at different time of the year.

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