Modelli e osservazioni satellitari per capire la distribuzione della plastica in mare

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LaMMA Consortium

(Laboratory of Environmental Monitoring and Modelling for the sustainable development)

Consiglio Nazionale delle Ricerche

REGIONE TOSCANA

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Whatever its origin is, a floating particle at the sea surface is advected by **ocean currents** (Martinez et al., 2009).

At global scale, Howell et al. (2012) indicate two mechanisms enhancing local litter concentration: **accumulation**, characterized by convergent particle paths; and **retention**, promoted by tracer homogenization processes inside closed streamlines (Franks, 1996).

Major garbage accumulation areas in the world ocean correspond to convergences of the portion of surface currents which are due to the effect of the local wind, which in their case includes windage, Stokes' drift and even Ekman currents, correctly identifying the different functioning of subtropical vs subpolar gyres in accumulating marine litter at the surface, which partly corresponded to **well known accumulation areas** at the time, and partly suggested where to look in order to find additional floating litter gathering zones in the world's ocean. Howell *et al.* (2012),

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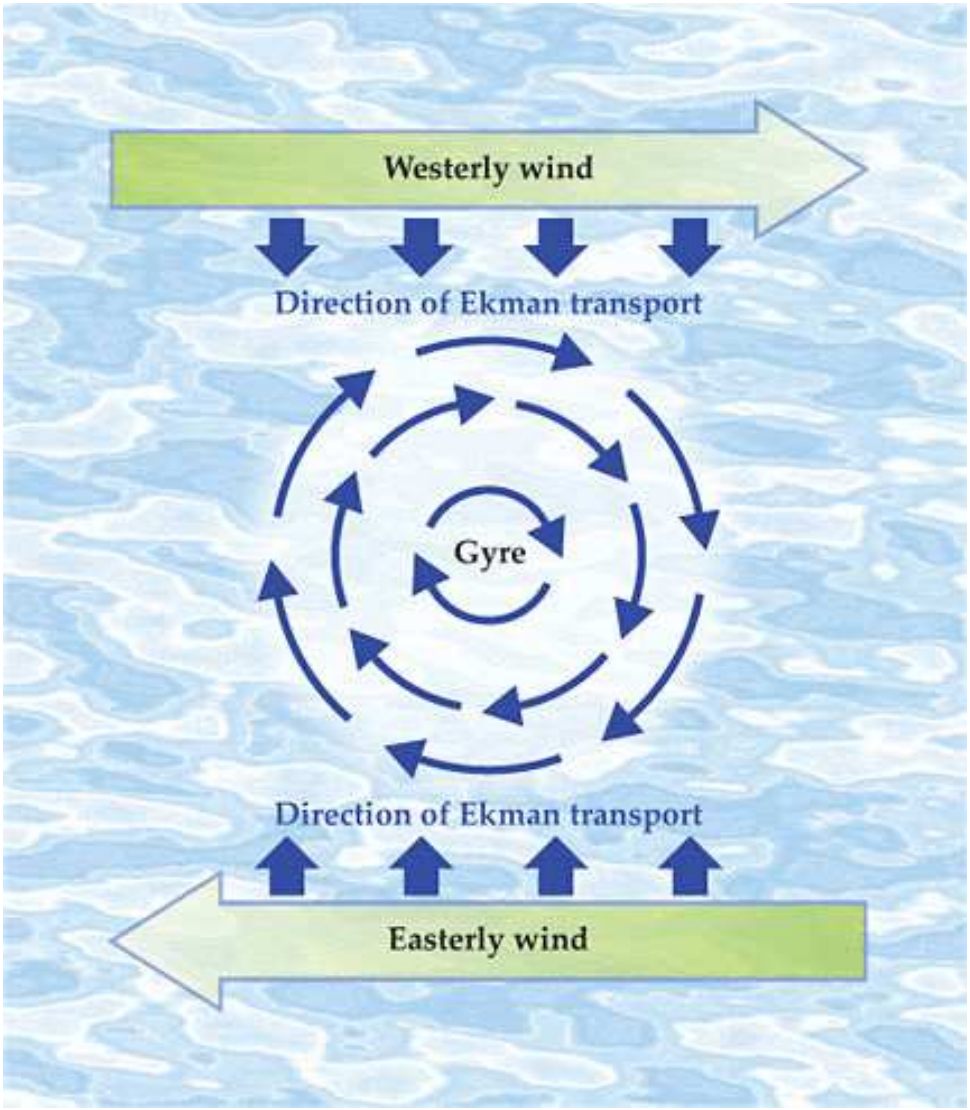
Alcuni meccanismi della circolazione globale



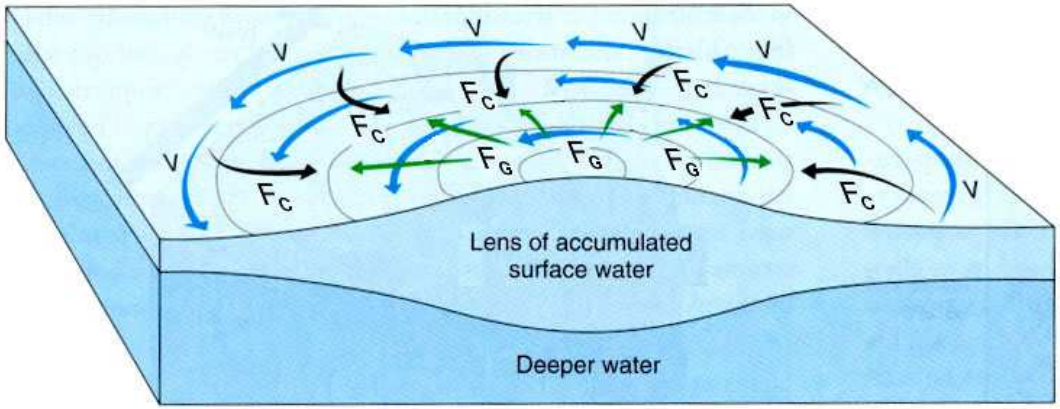
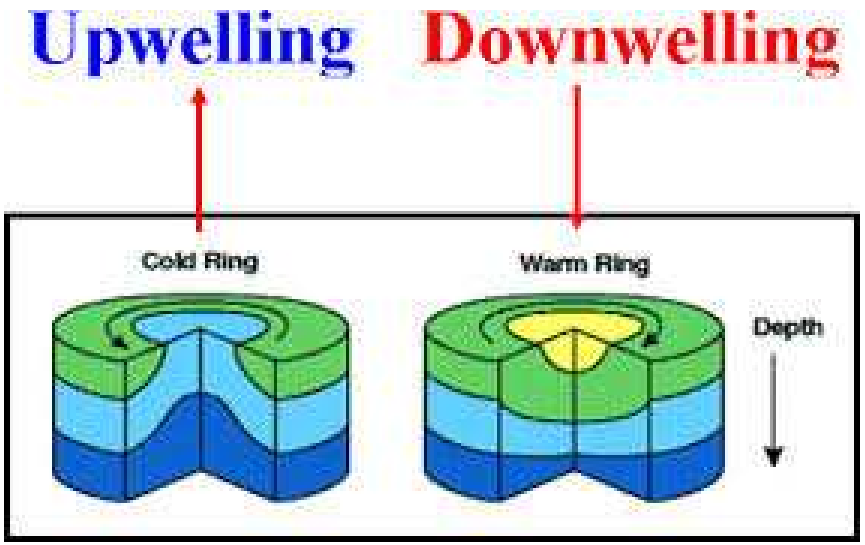


Fig.5 Currents flow (V) around a gyre when the inward Ekman transport due to the Coriolis effect (Fc) is balanced by Fg, the outward force due to gravity.



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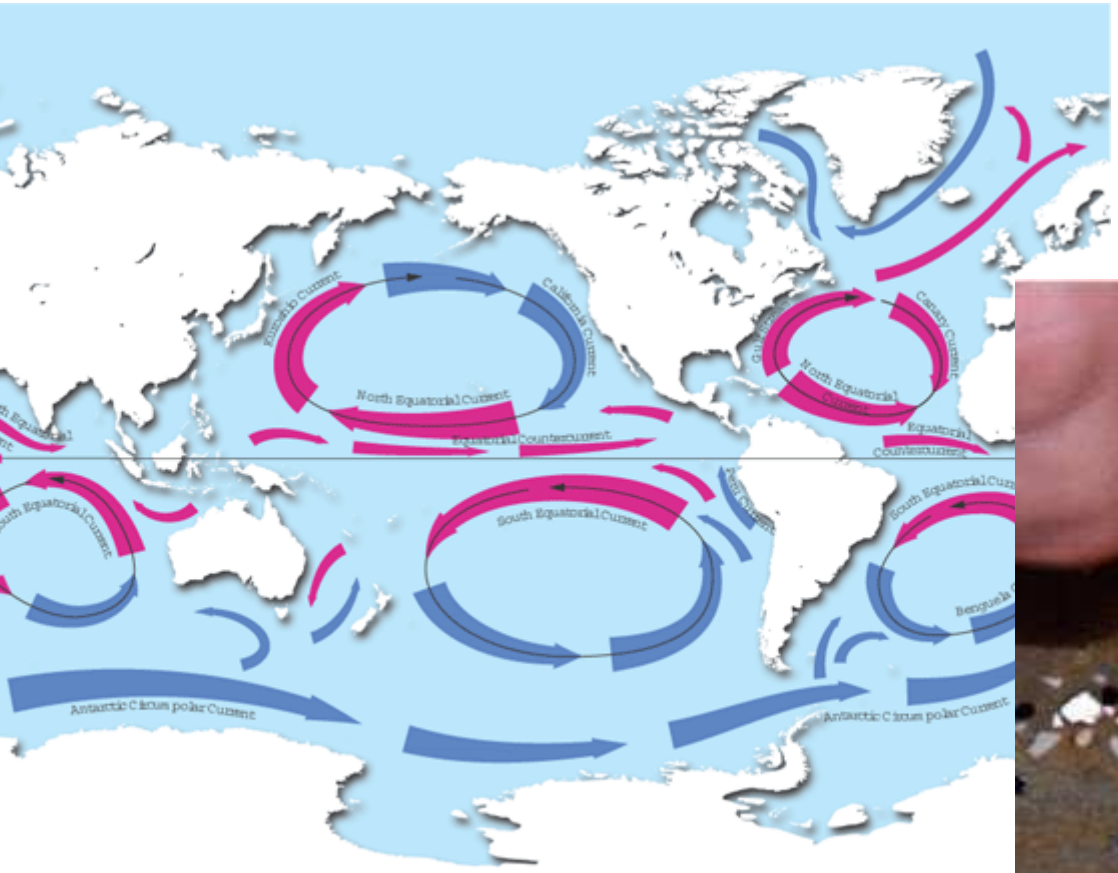
Correnti oceaniche superficiali permanenti



Ocean Currents

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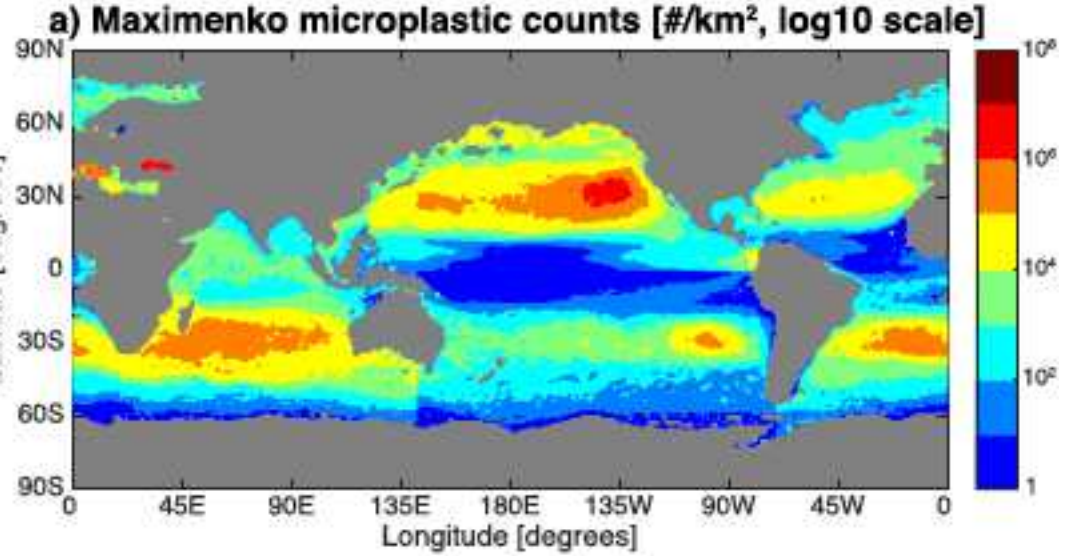
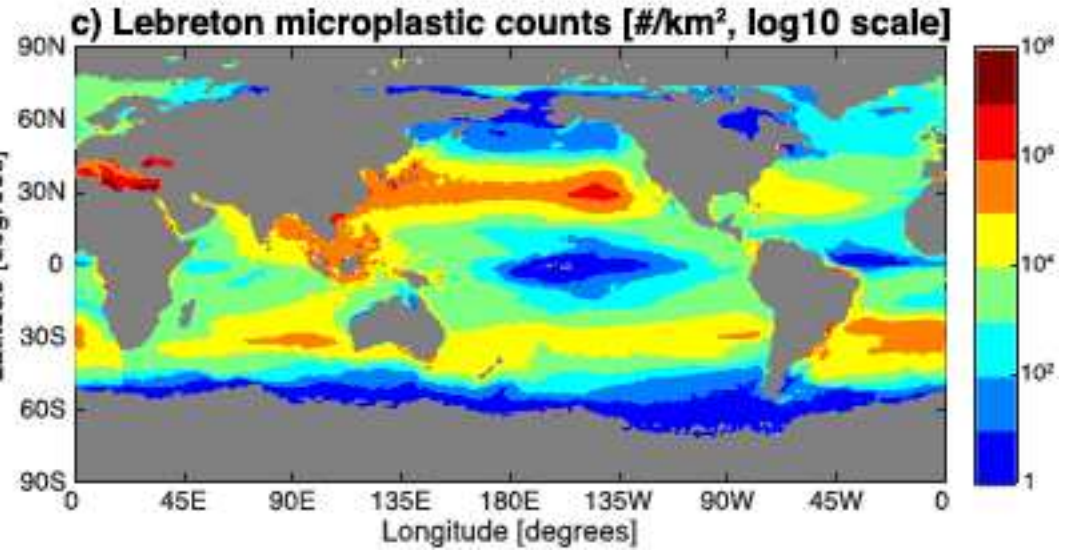
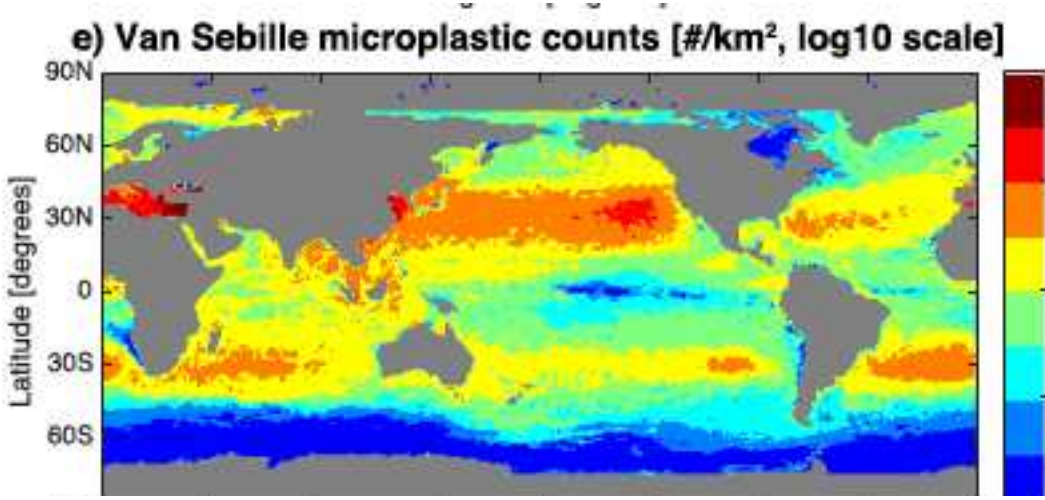
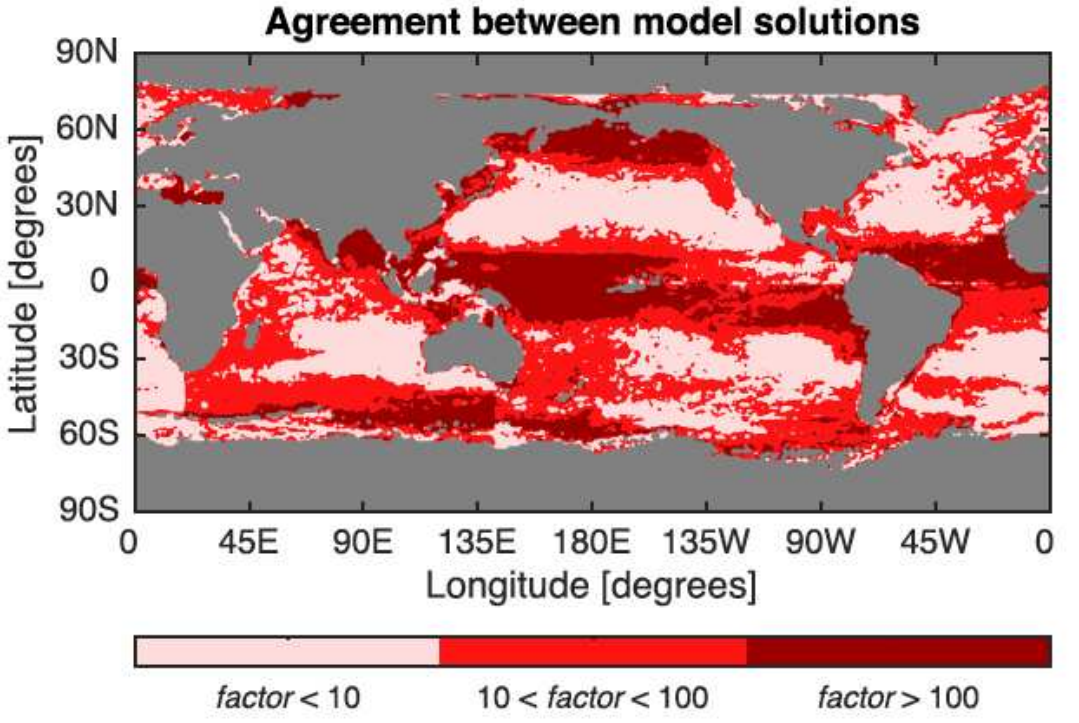
Stime globali

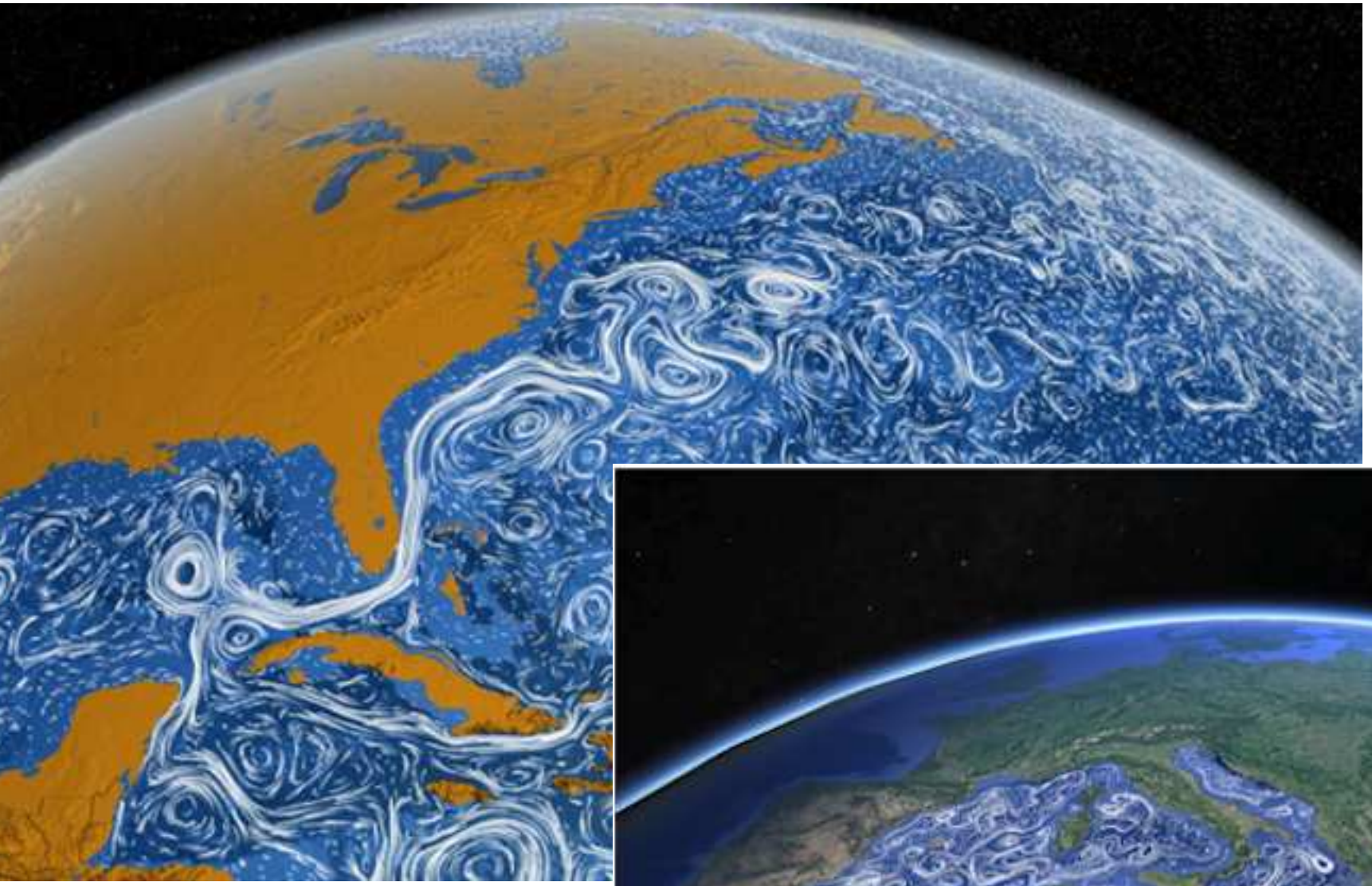
Van Sebille et al., 2016











La circolazione
molte scale …

.. anche nel
Mediterraneo ….

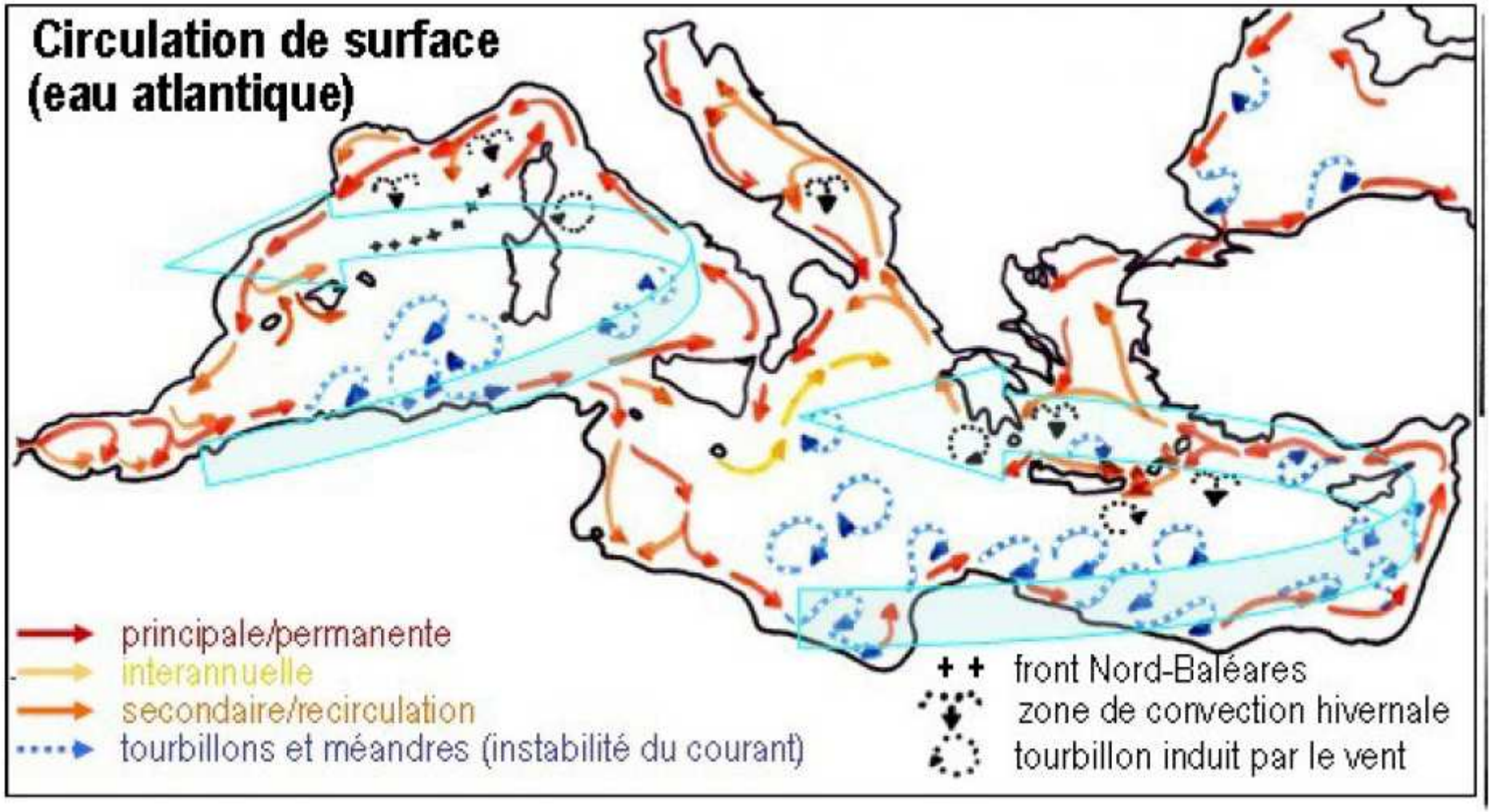


Fig. 2. Courants majeurs mediterraneens, d'apres Millot & Taupier-Letage 2005).

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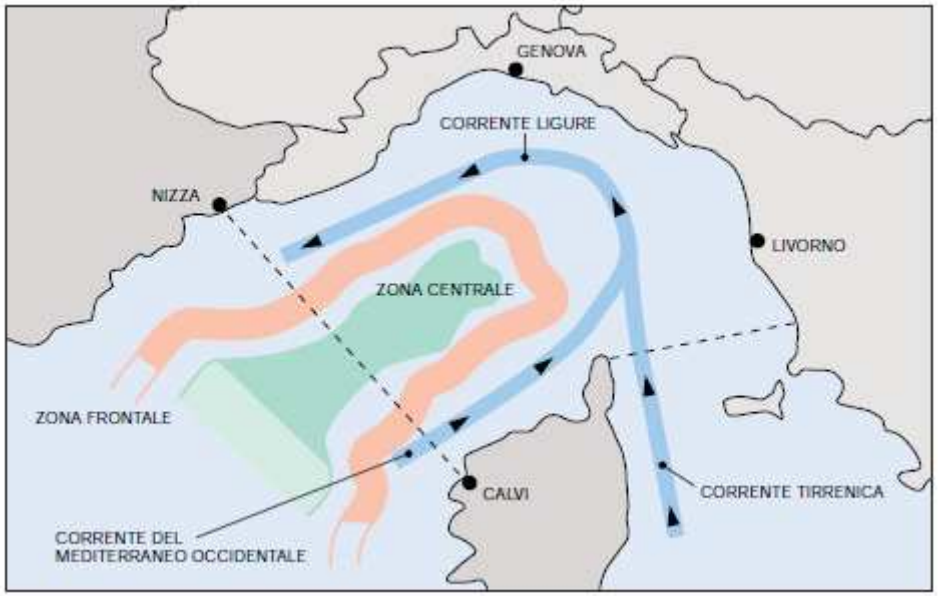
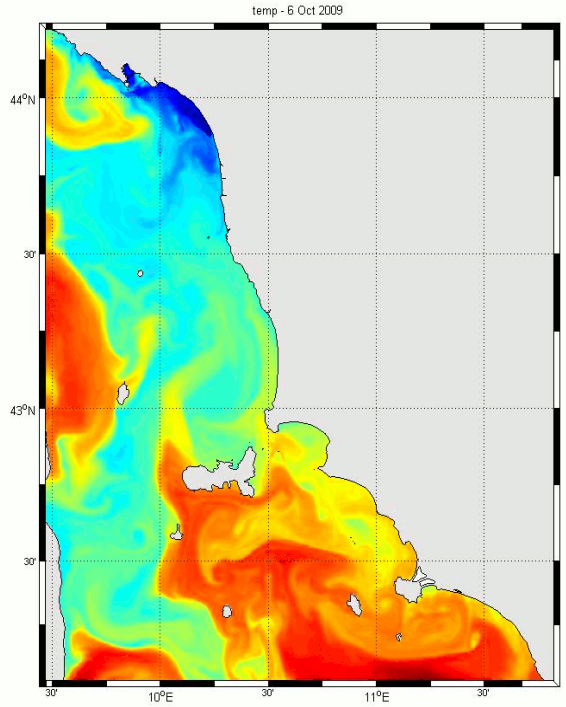
An overview of the Ligurian/North Tyrrhenian

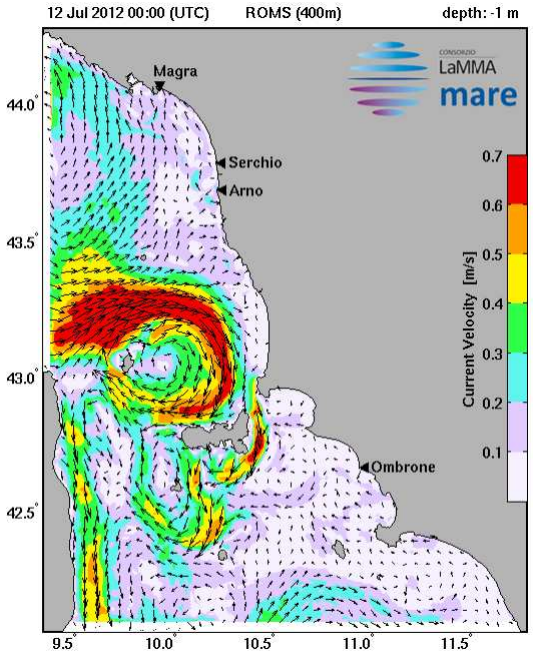


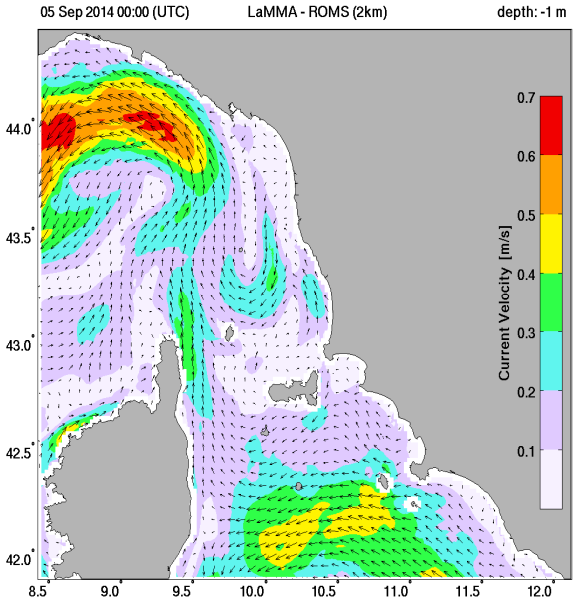
Modellistica idrodinamica

Modello oceanografico **ROMS** (Regional Ocean Modeling System) ad alta risoluzione (temperatura, salinità, correnti).



Temperatura





http://www.lamma.rete.toscana.it/mare/modelli/correnti

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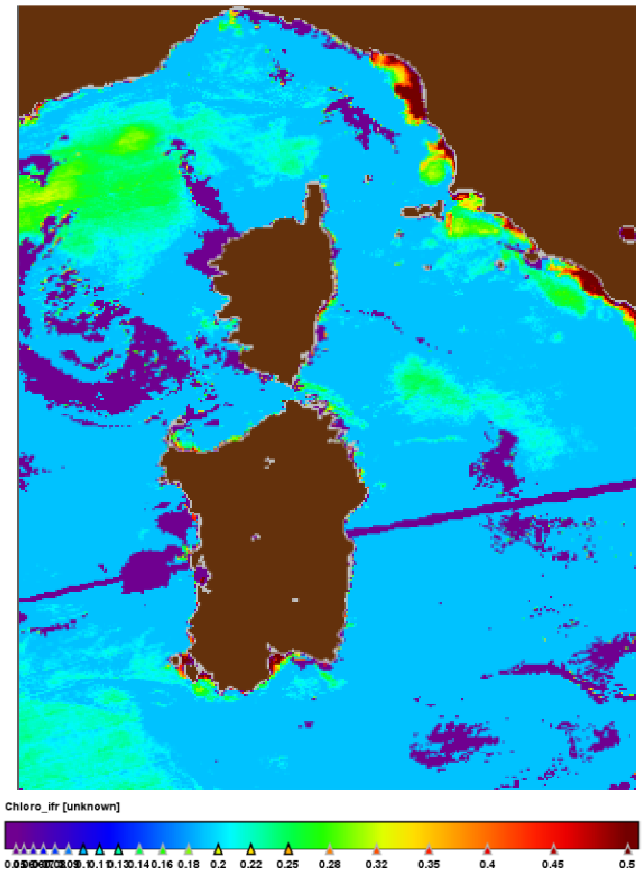
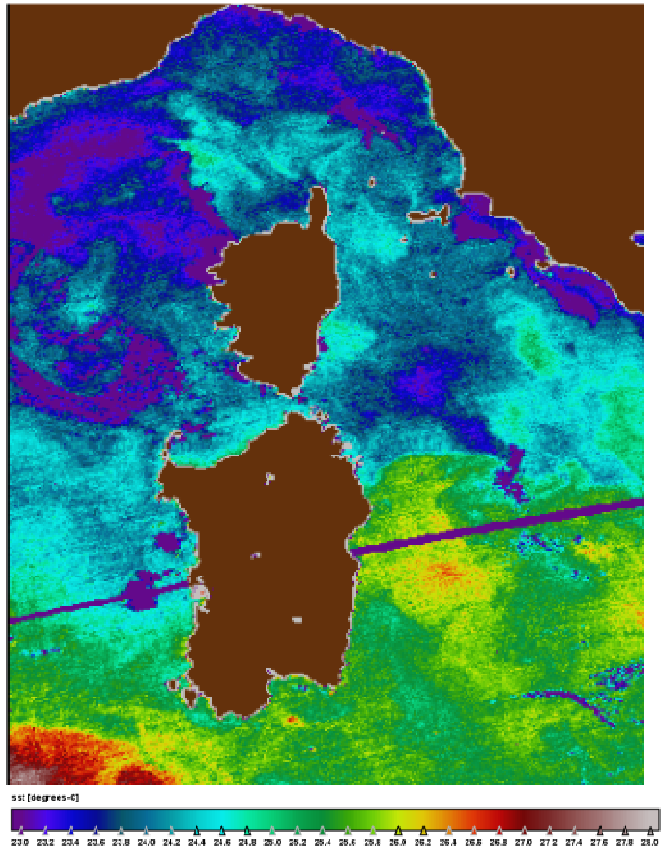
Mappe di clorofilla e SST da satellite MODIS AQUA

OC5 Chlorophyll a mg/m^3



SST



13 September 2014

http://www.lamma.rete.toscana.it/mare/osservazioni-satellite/mappe-clorofilla

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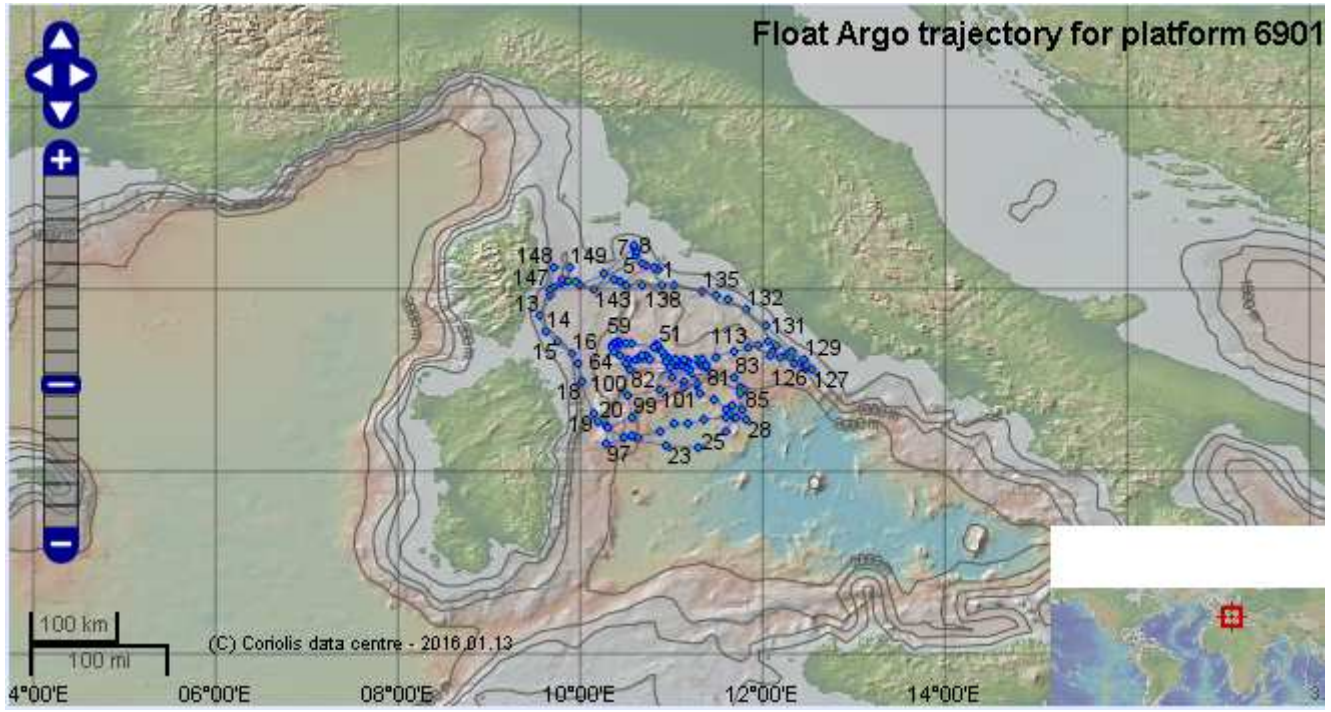

OGS ISTITUTO NAZIONALE di Oceanografia e di Geofisica Sperimentale

Italian contribution to global ocean monitoring
ARGO - ITALY

http://www.lamma.rete.toscana.it/boe-flottanti

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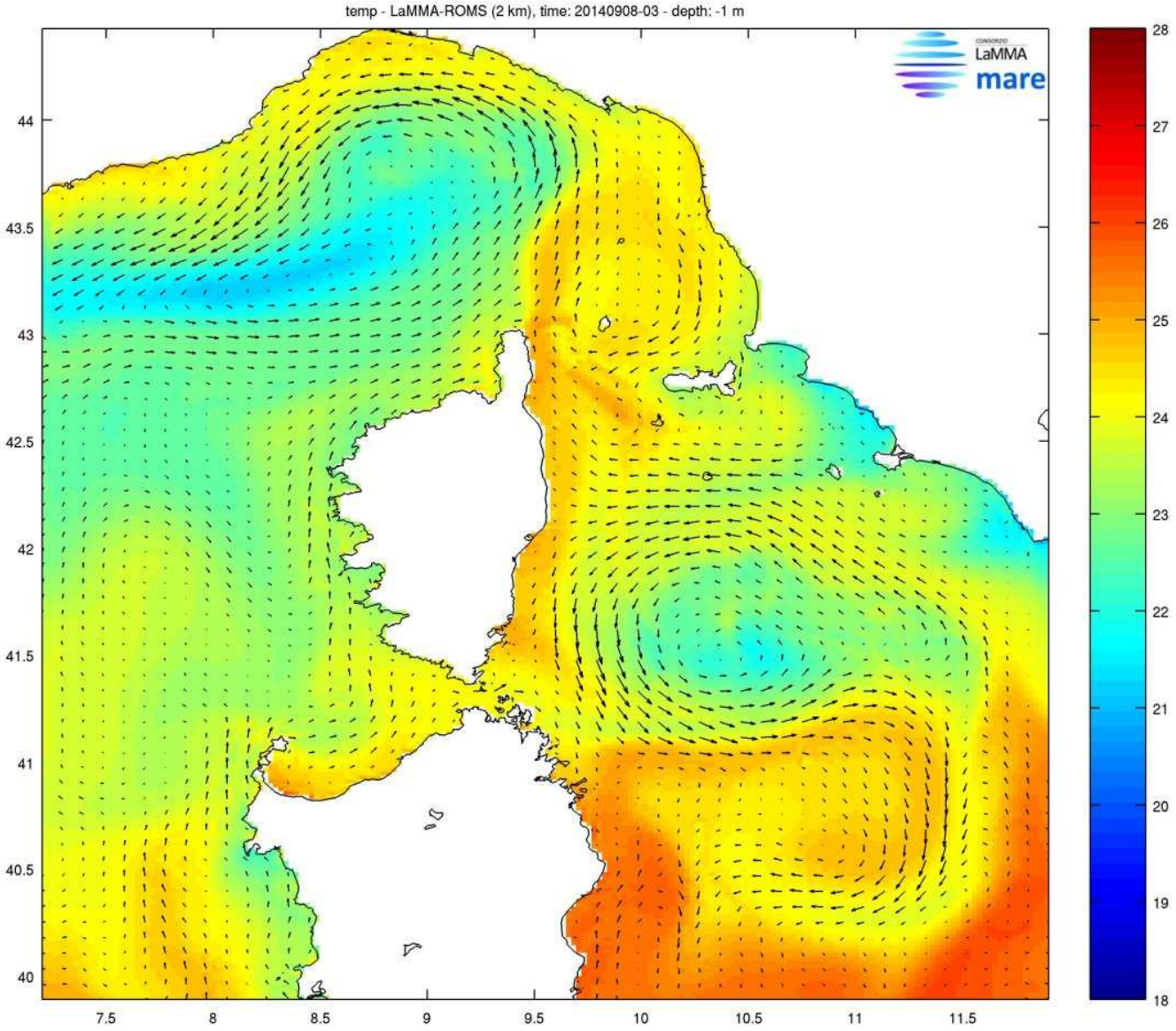

Tyrreno ROMS http://www.lamma.rete.toscana.it/mare/modelli/correnti

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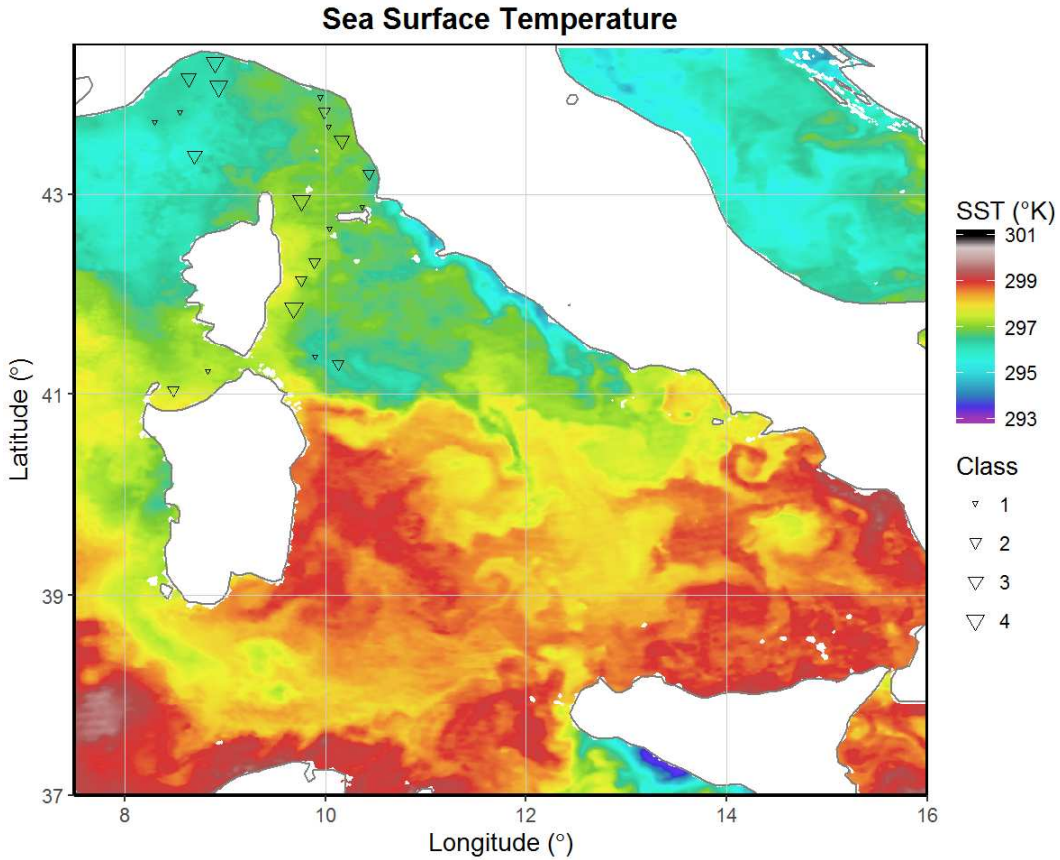
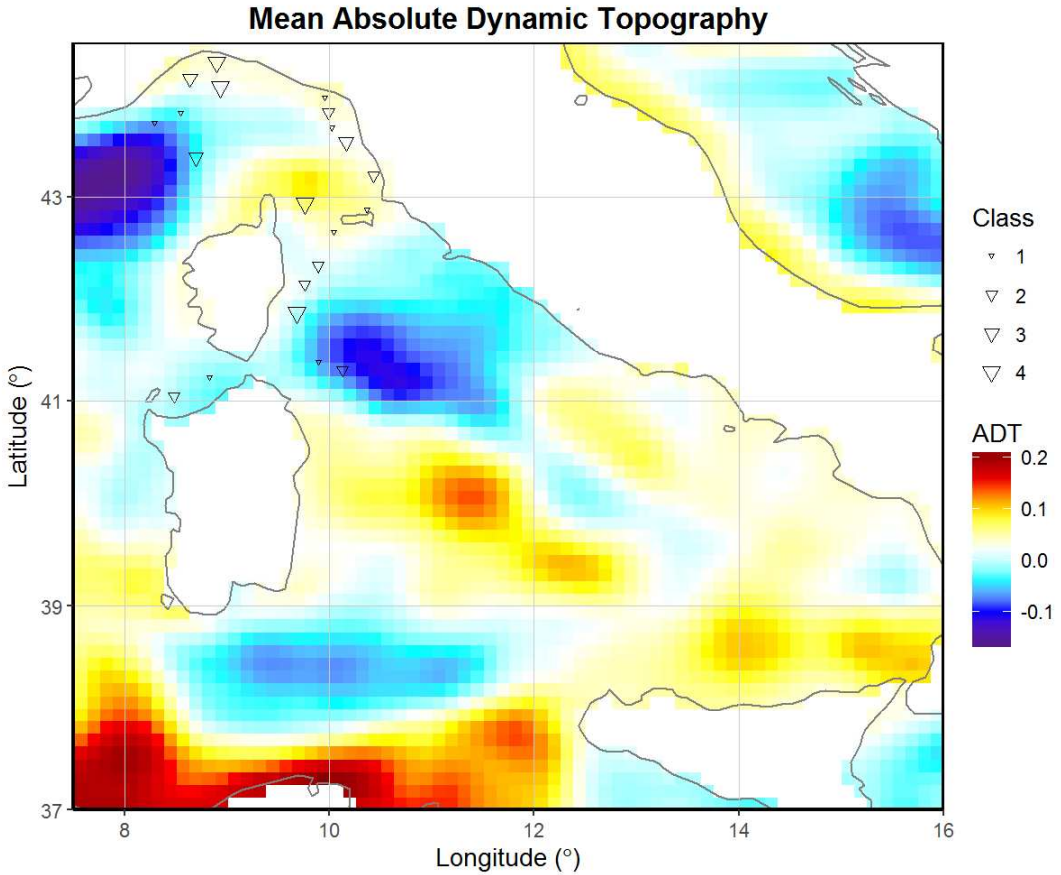
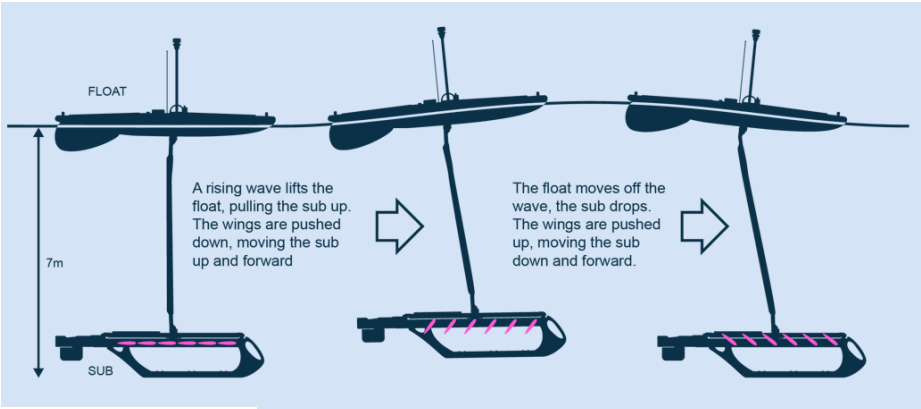
Compare filled Surface Level Temperature with mean Absolute Dynamic Topography (2014-09-08)



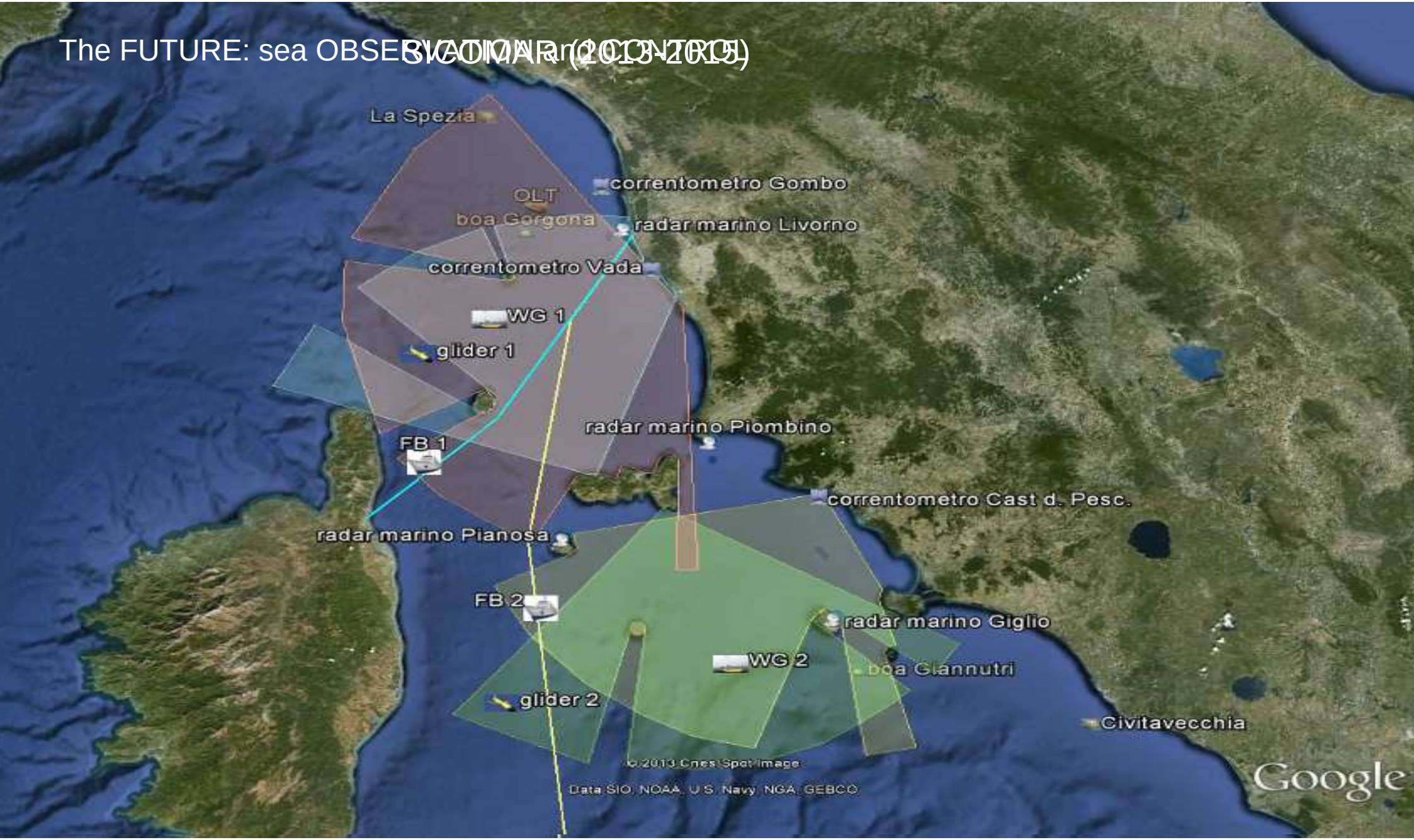


Sea Surface Temperature - Copernicus Marine Service Products: Copernicus (http://marine.copernicus.eu/)

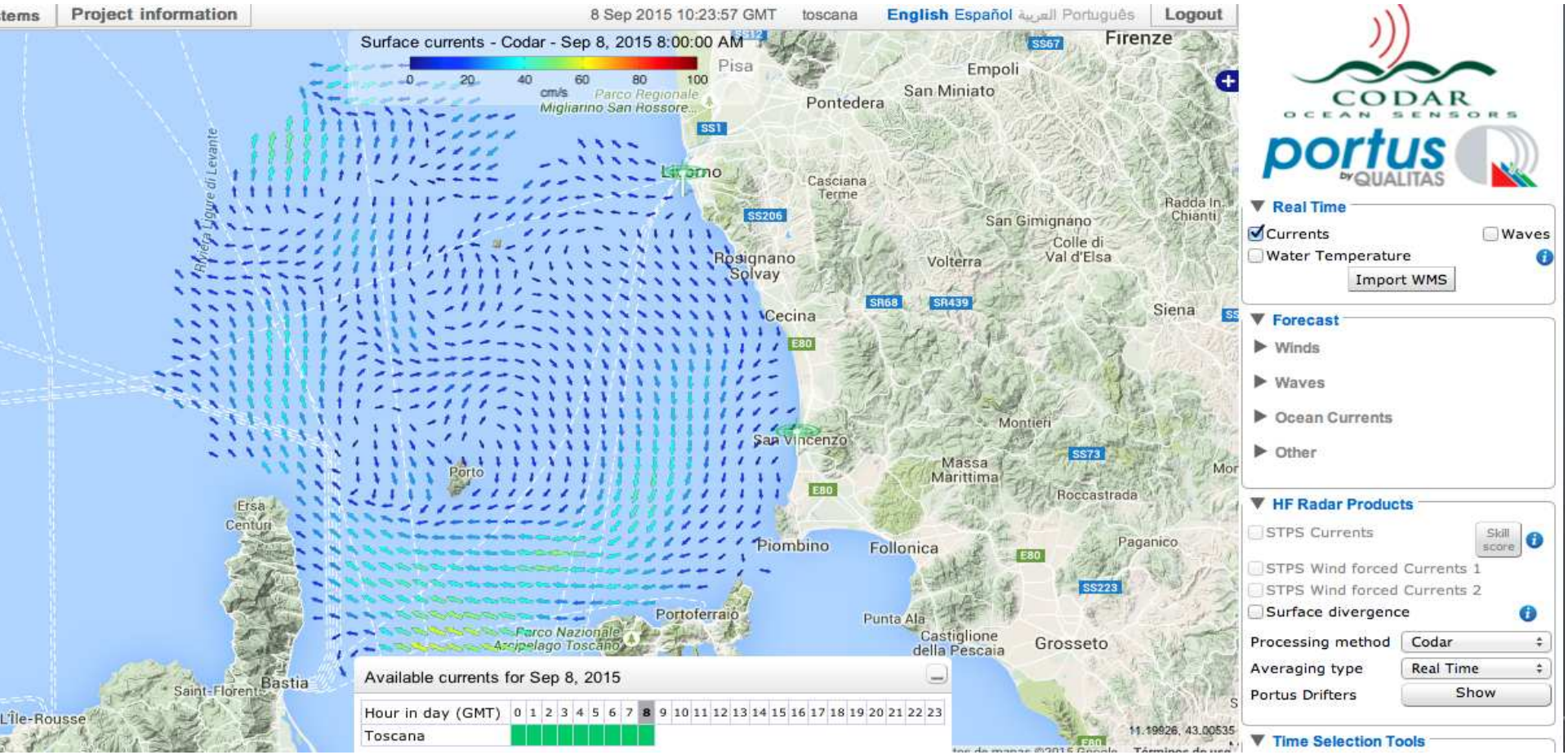
Absolute dynamic topography (ADT) Ssalto/Duacs by Aviso, with support from Cnes (http://www.aviso.altimetry.fr/duacs/)



Building a measurement network for sea observation and control

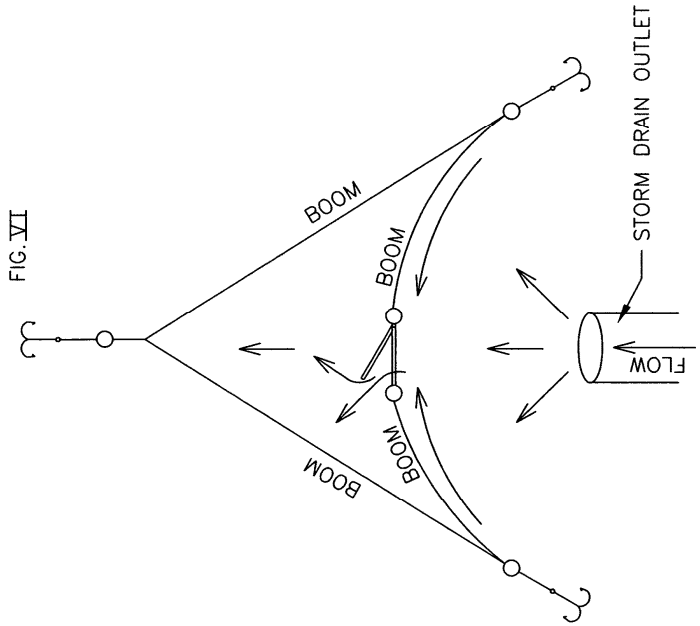


Radar tools: HF radar systems



Usare delle mappe “dinamiche” per ottimizzare il percorso di macchine pulitrici ?

Un numero crescente di brevetti ma…
è questa la strada?



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Conclusioni:
Costruire obiettivi concreti

Conoscere meglio per valutare gli impatti effettivi

→Costruire indici di rischio efficaci

Ottimizzare l'attività di campionamento

→Costruire mappe affidabili

Usare la conoscenza per organizzare attività di contrasto a vario livello: programmazione, governance, mitigazione.