

The Ligurian Dispersion Experiment – LIDEX10:

preliminary results

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Main Objectives

- To study the horizontal dispersion induced by the near-surface currents in open sea and coastal environments (including across frontal area associated with river plumes).
- To study the influence of ocean variability on the dispersion at submesoscale ($< \sim 10$ km), mesoscale ($\sim 10-20$ km) and sub-basin (~ 100 km) scales in the Mediterranean.
- Applications: oil spills, Search-and-Rescue operations, drifting mines, etc.



Means

- Deployments of numerous Lagrangian drifters at adequately chosen positions to directly measure horizontal dispersion.
- Additional info on 3D dynamical structures provided by floats, gliders and research vessels.
- Near-surface signatures obtained from satellite images (SST, Ocean Color, altimetry).
- Numerical simulations (hindcasts & forecasts)



Ligurian Sea - LIDEX10

- 27 CODE drifters with Argos/Iridium telemetry and GPS positioning were released in two deployment episodes in July and August 2010 (in cooperation with REP10 Experiment).
- 1 SVPB drifter with Argos telemetry and drogue at 15 m depth.
- The drifters were released in clusters of 9 units separated initially by distance ranging between 50 and 500 m.



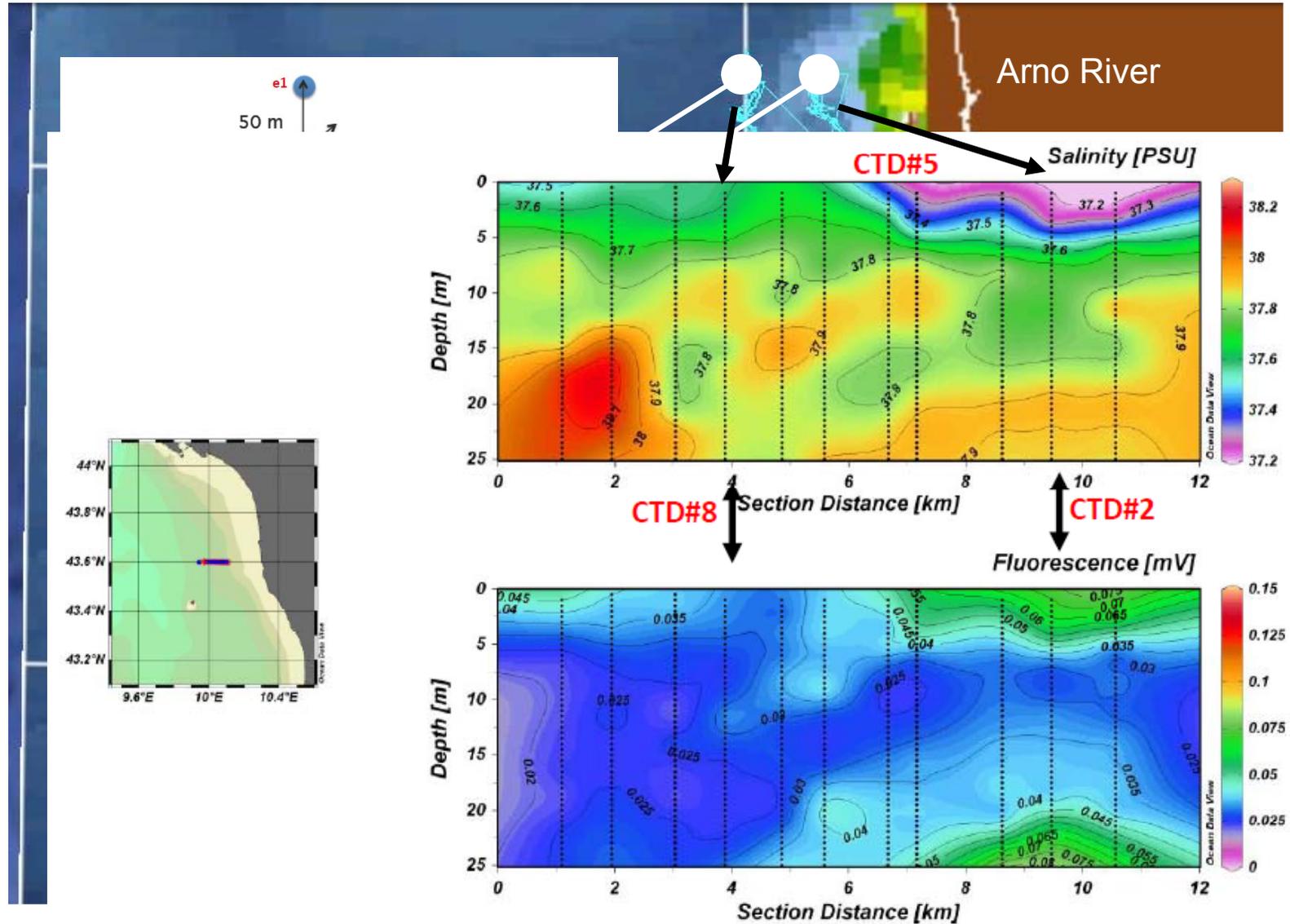
Ligurian Sea - LIDEX10

- 1 Arvor profiling float was deployed in the vicinity of the drifters to provide T/S profiles on a daily basis.
- 1 battery-powered Slocum glider was steered to follow the majority of the drifters and provide high-resolution data (T, S, etc.) as deep as 200 m.



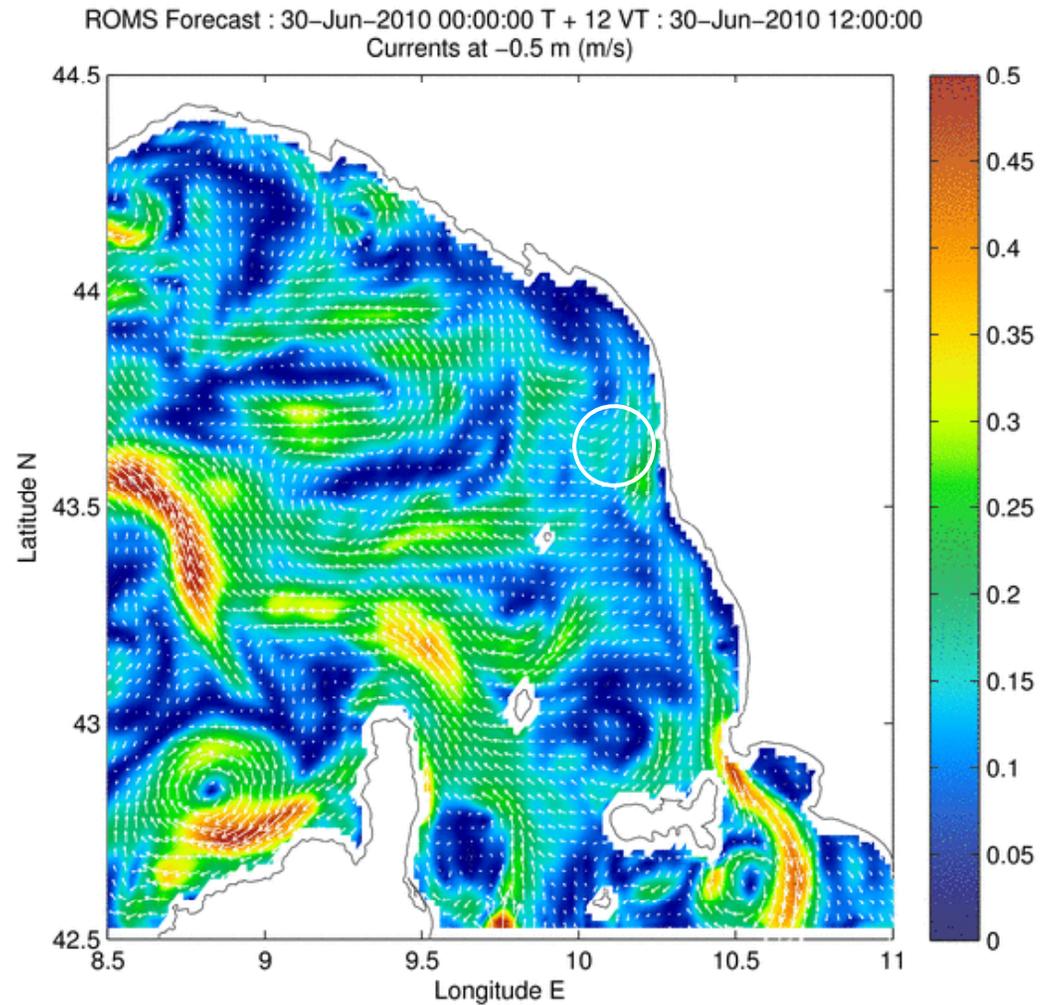
July deployments

21 CODE drifters, 1 float and 1 Glider deployed on 3 July 2010 in Southeastern Ligurian Sea across coastal front



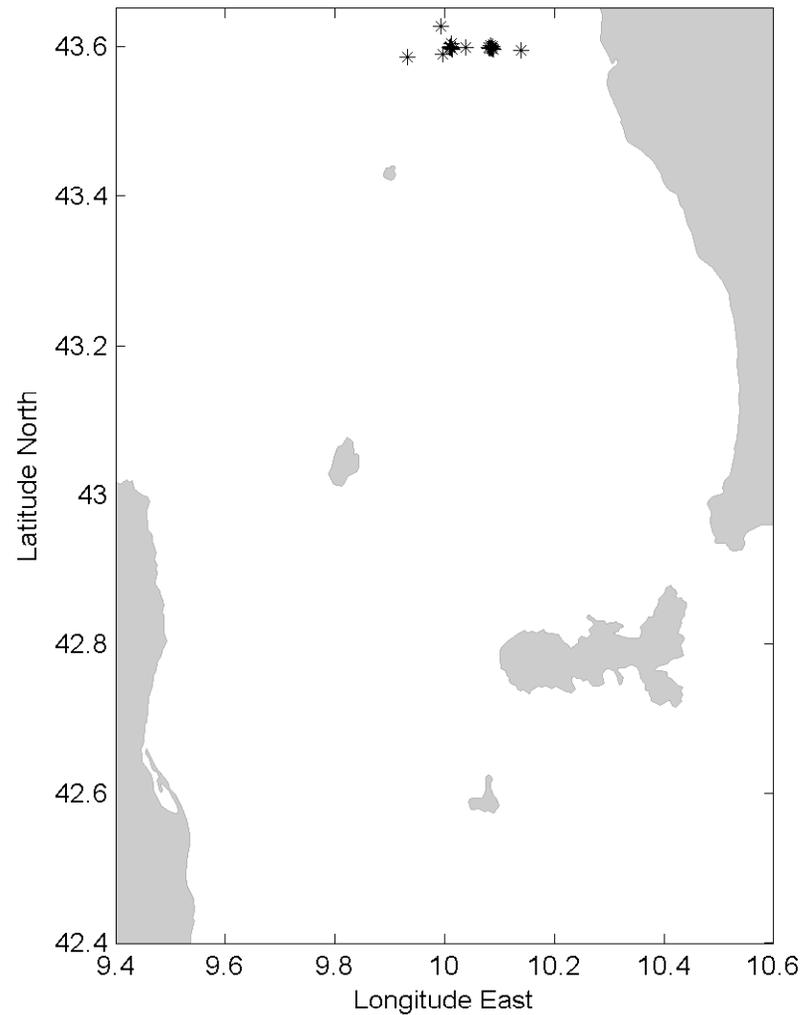
July deployments

Example of ROMS numerical simulation



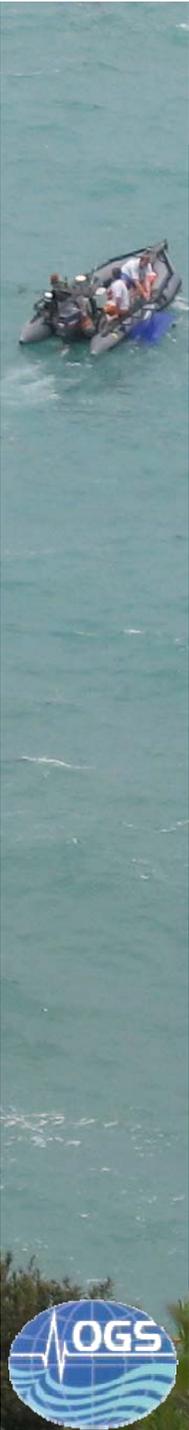
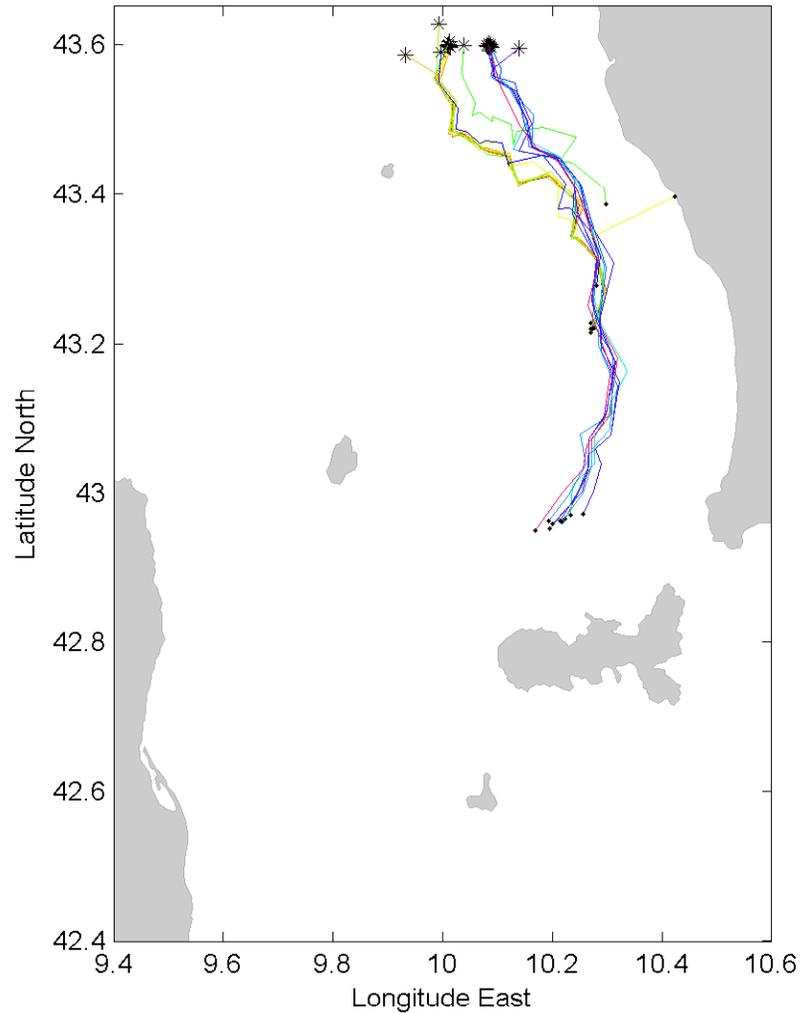
July deployments (0 day – 3 July)

Spaghetti diagram after 0 days



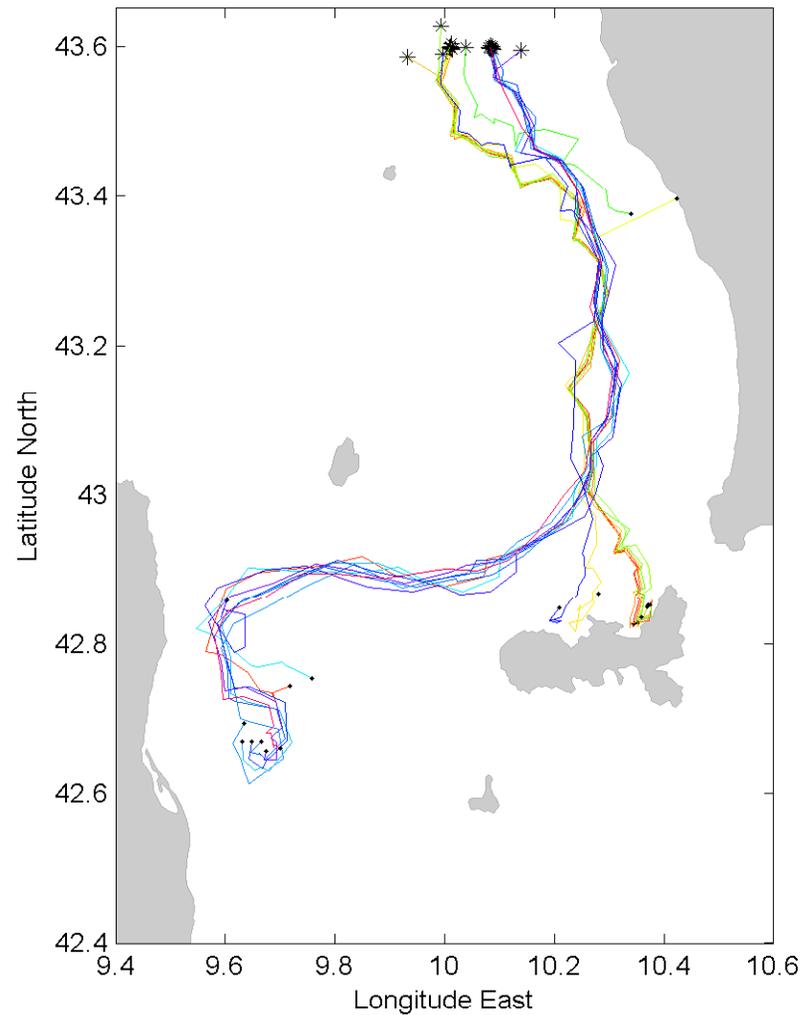
July deployments (5 days – 8 July)

Spaghetti diagram after 5 days



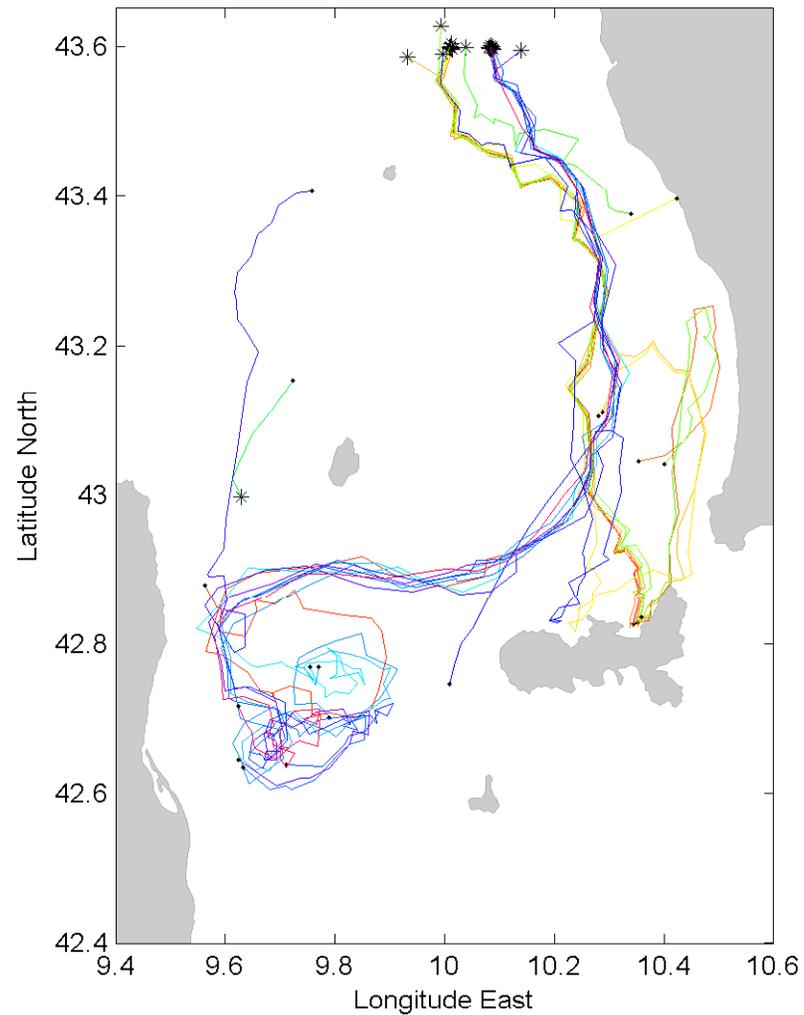
July deployments (10 days – 13 July)

Spaghetti diagram after 10 days



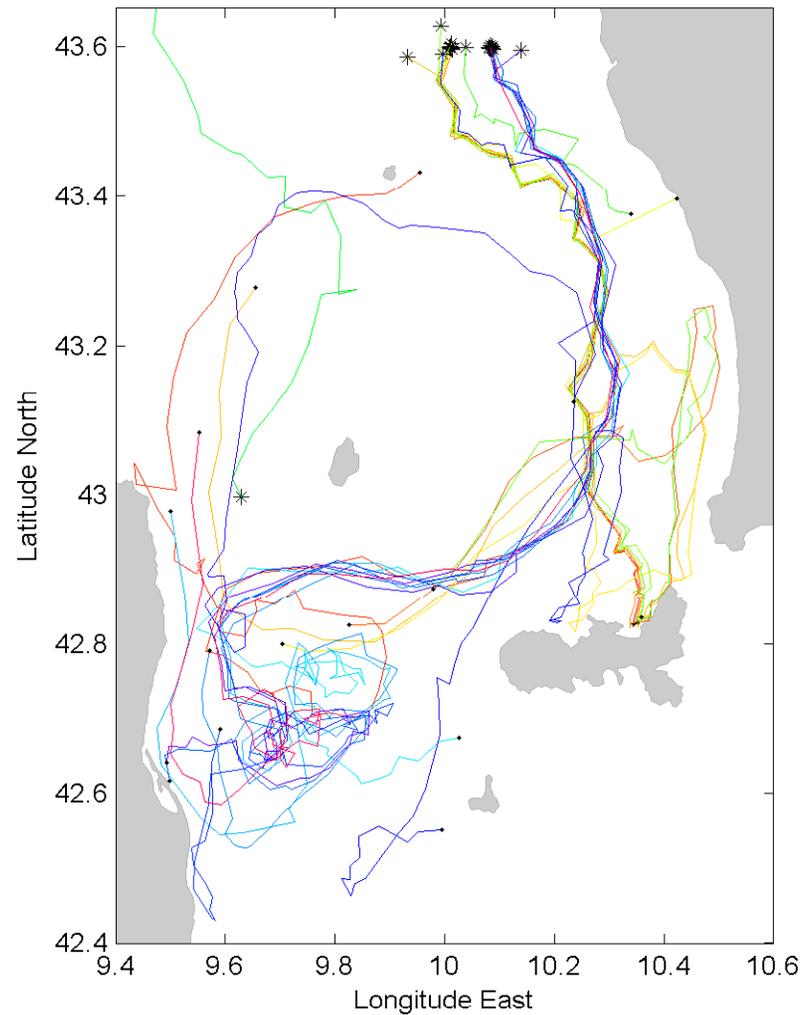
July deployments (15 days – 18 July)

Spaghetti diagram after 15 days



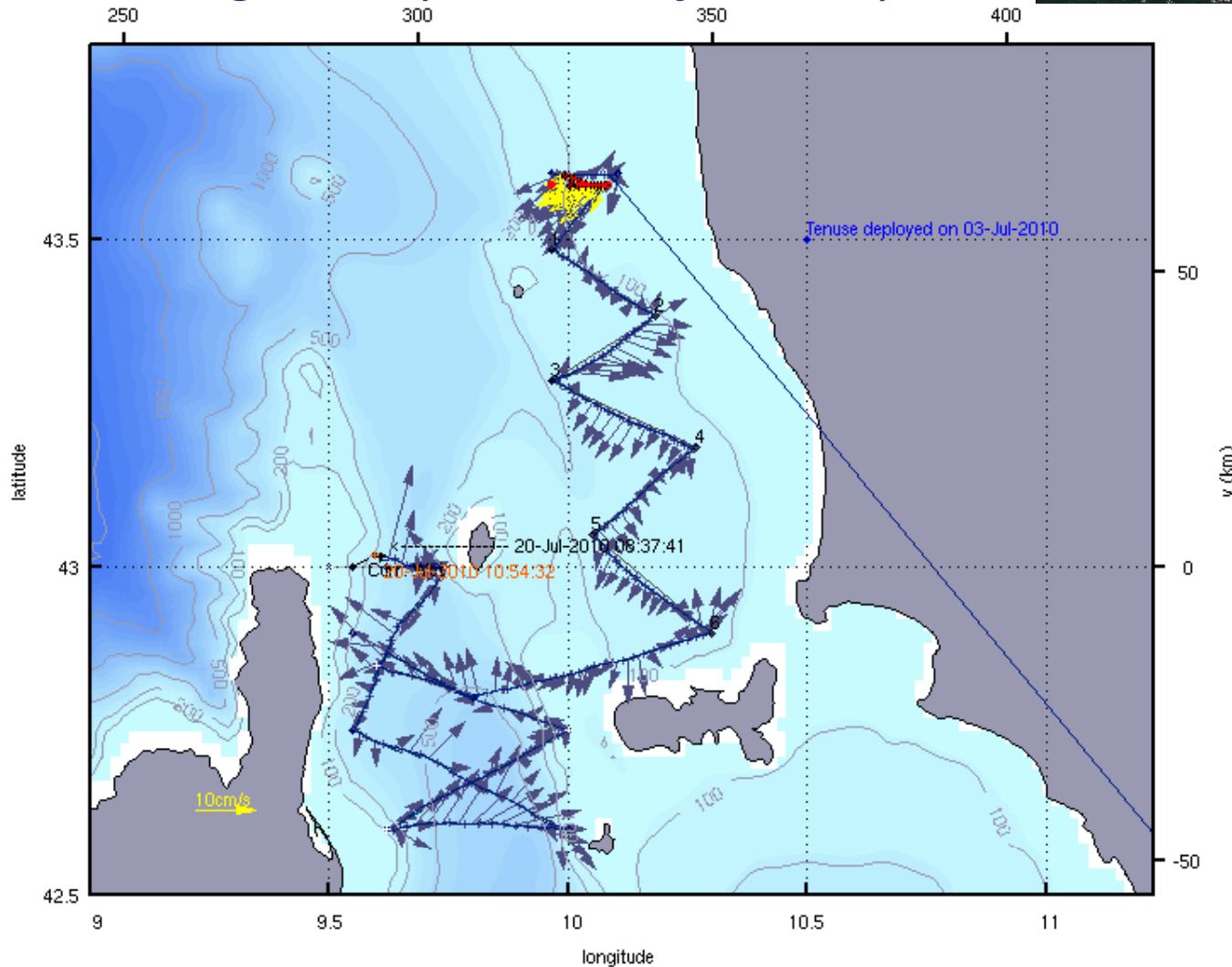
July deployments (20 days – 23 July)

Spaghetti diagram after 20 days



July deployments

Slocum glider (3-20 July 2010)

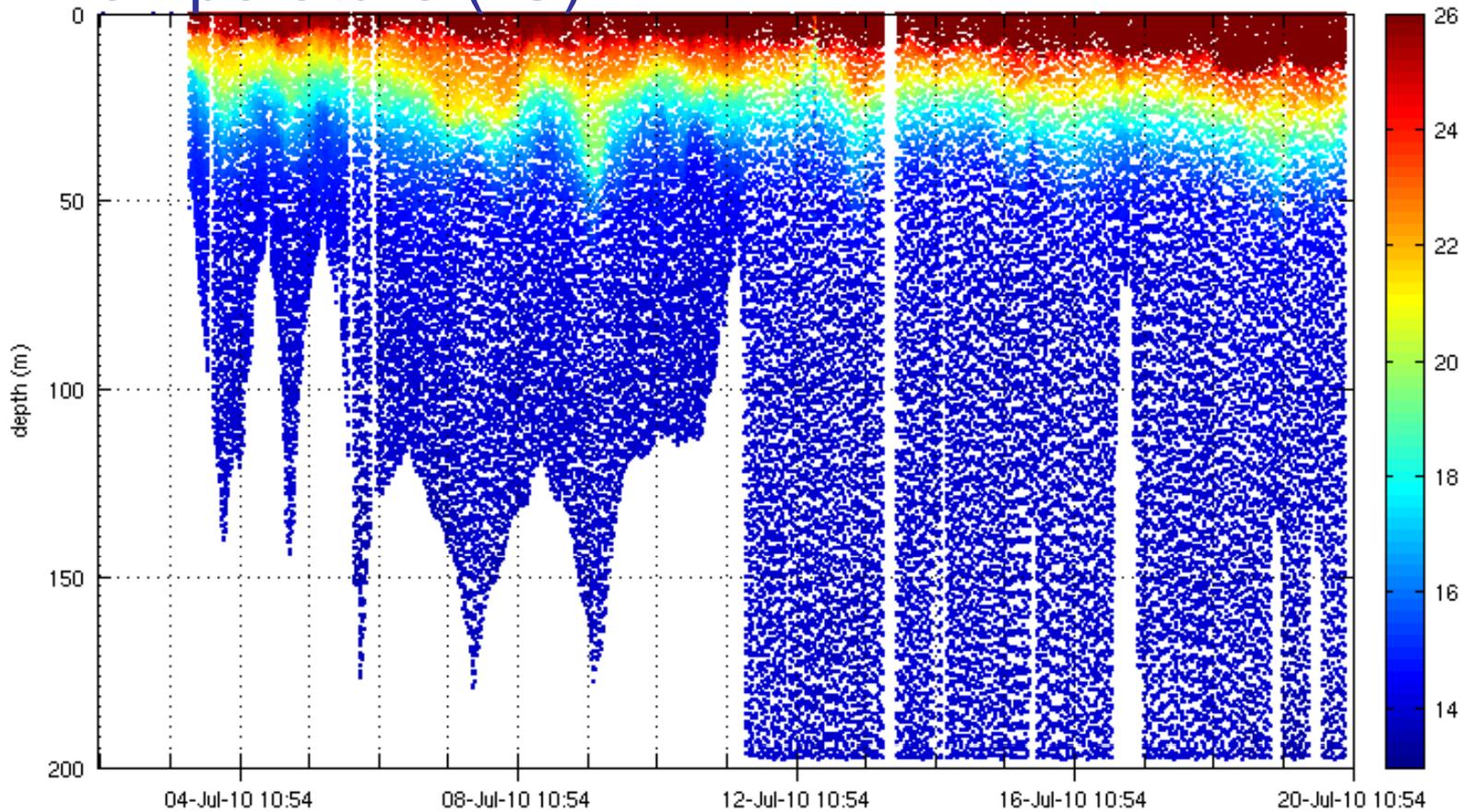


July deployments

Slocum glider (3-20 July 2010)



Temperature (°C)

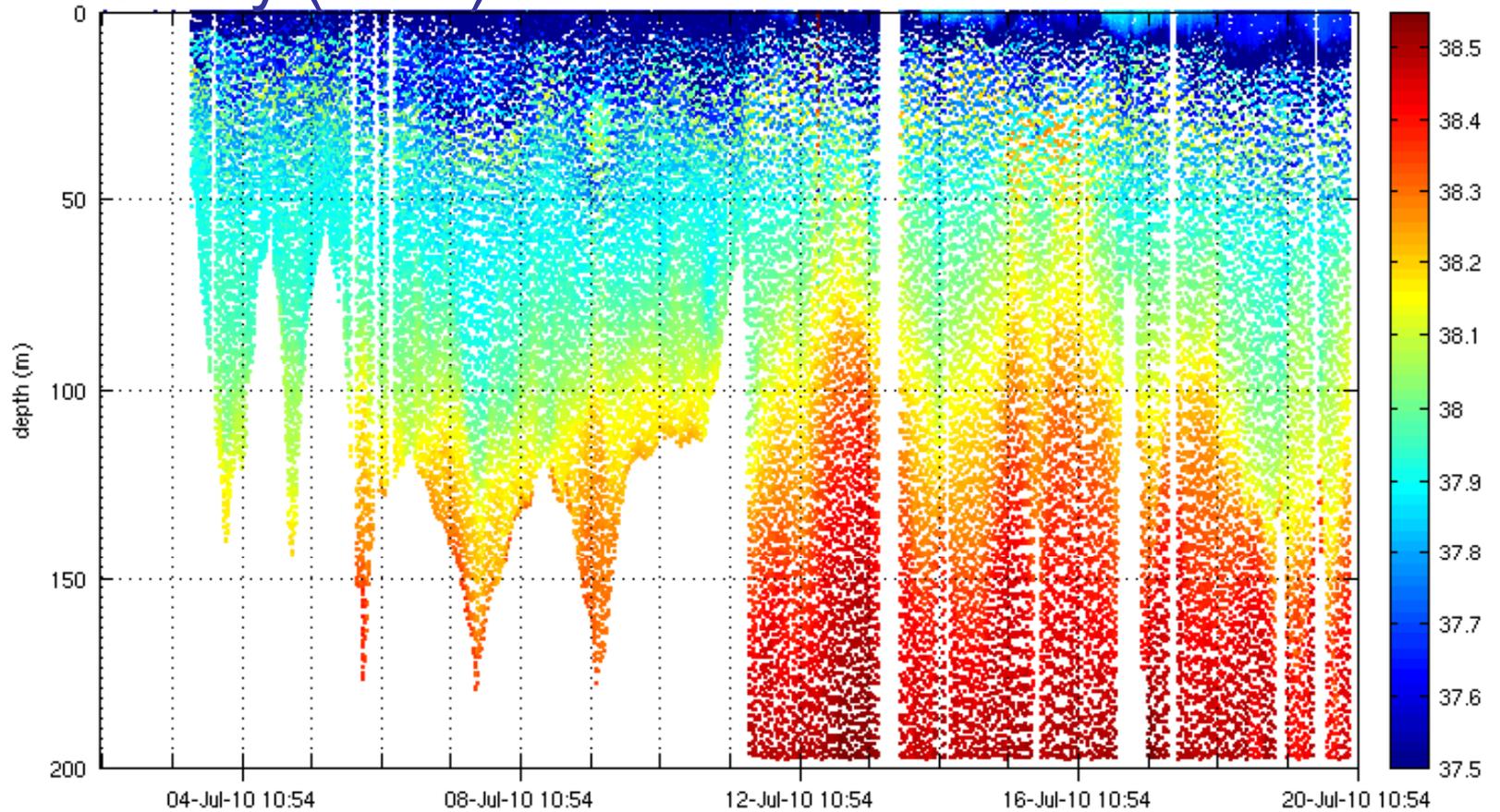


July deployments

Slocum glider (3-20 July 2010)



Salinity (PSU)

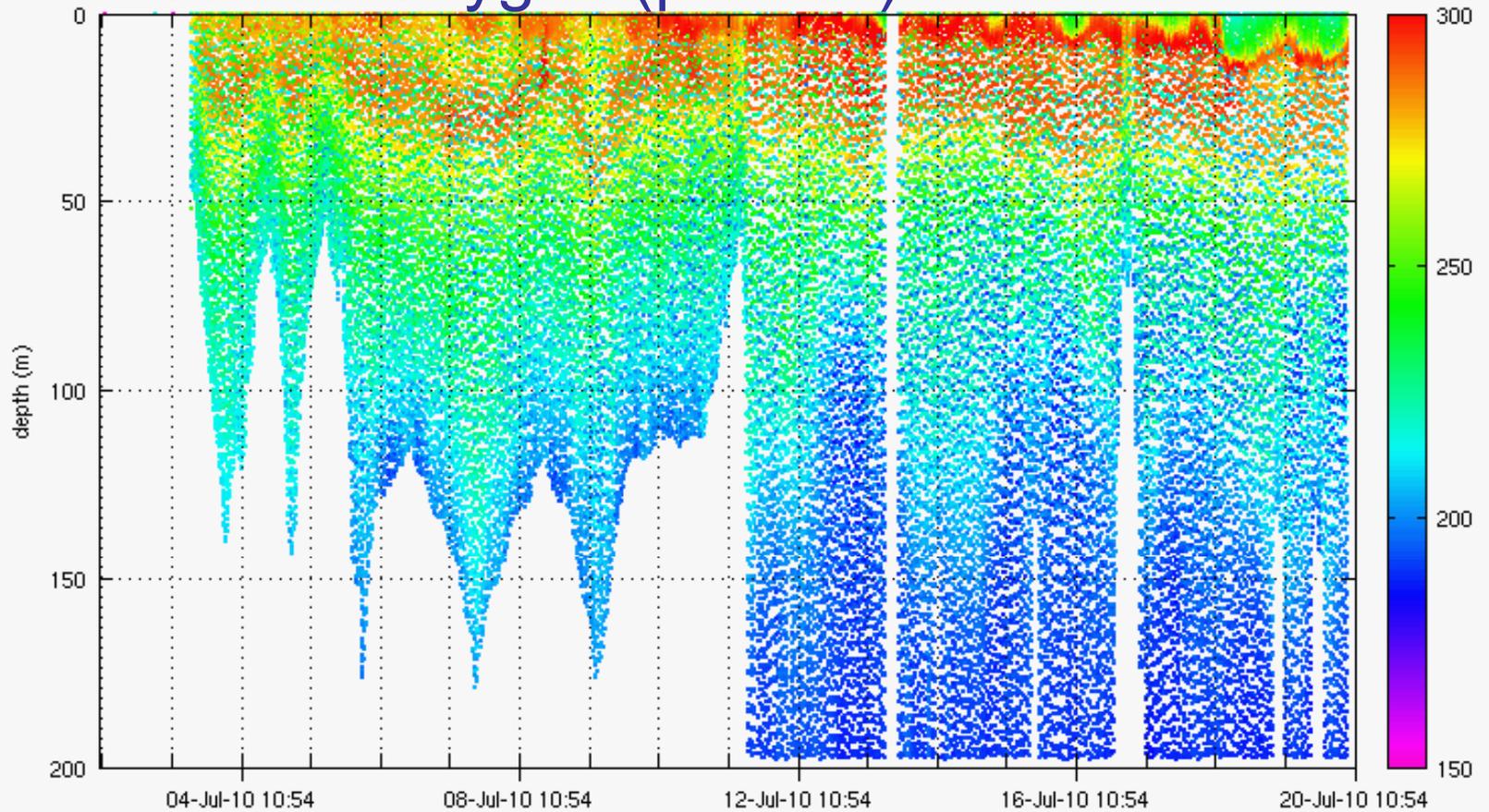


July deployments

Slocum glider (3-20 July 2010)



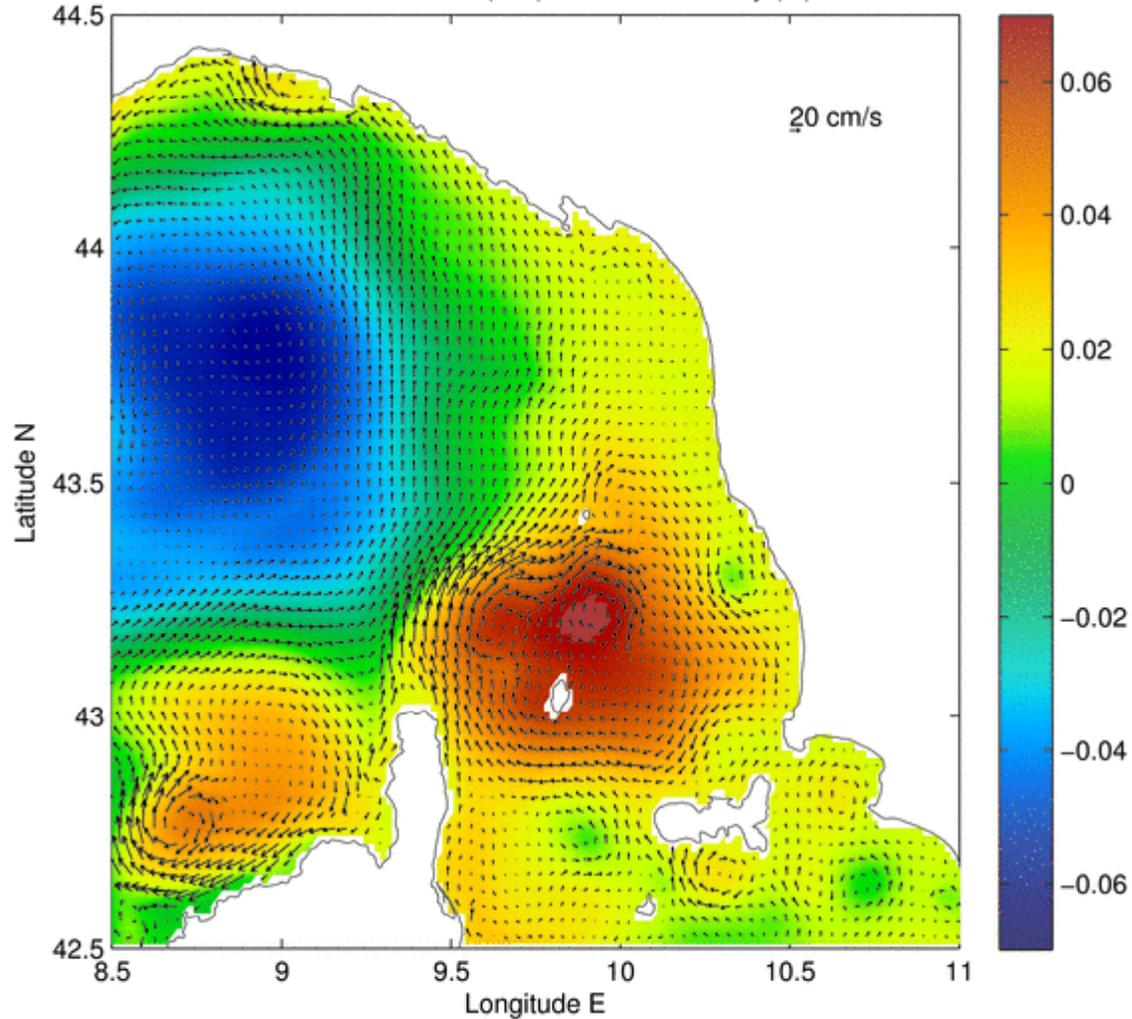
Dissolved Oxygen ($\mu\text{mole/l}$)



August deployments

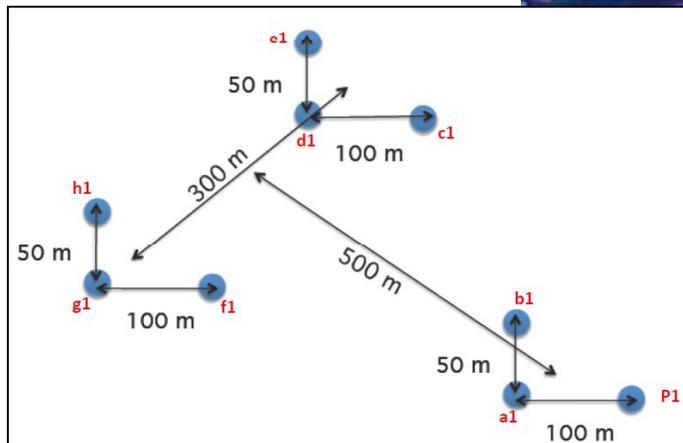
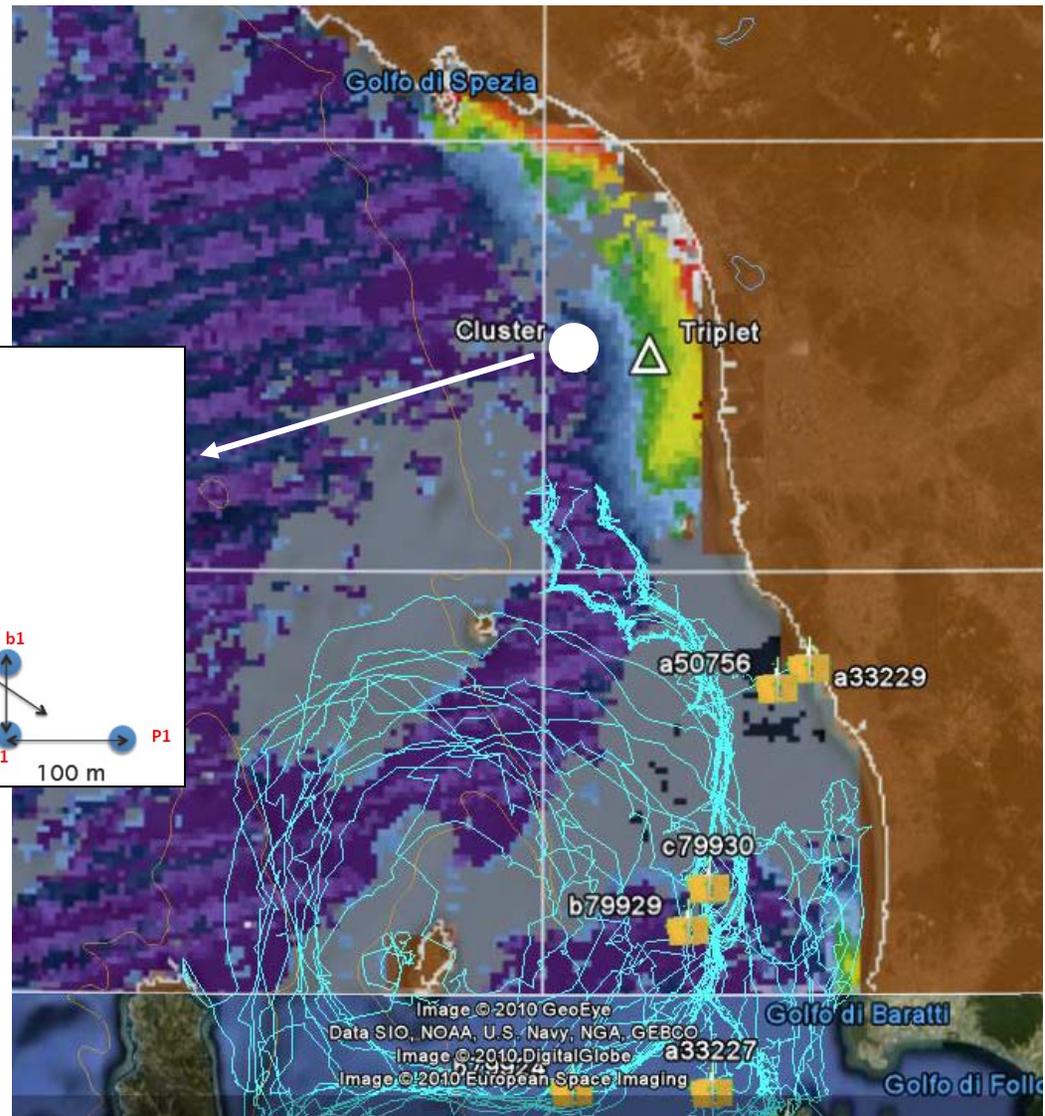
ROMS numerical simulations

ROMS Forecast : 17/08/2010 00:00:00 T : VT : 19/08/2010
Currents at -0.5 m (m/s) and SSH anomaly (m)



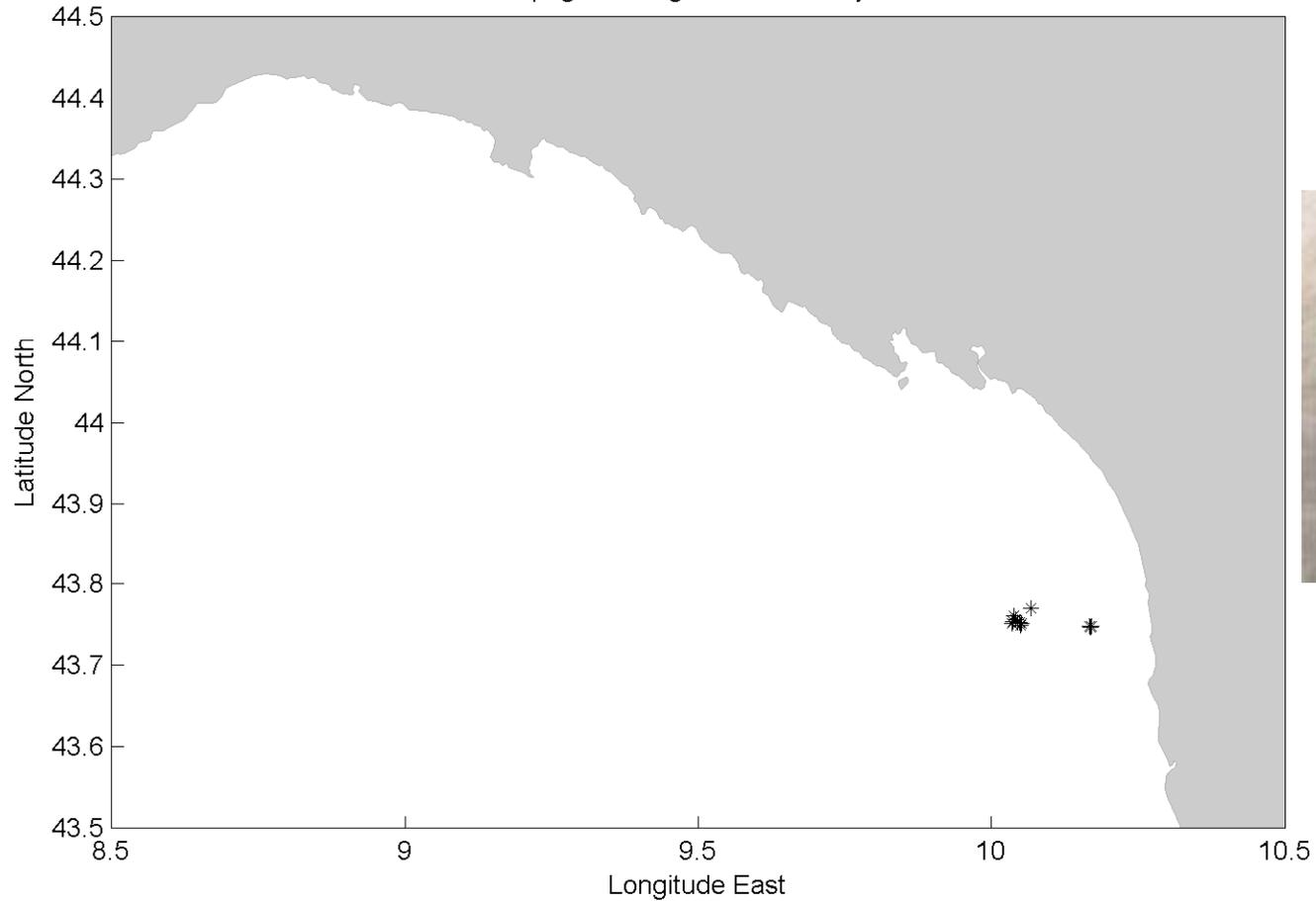
August deployments

11 CODE drifters, 1 SVPB drifter and 1 float deployed on 22 Aug 2010 in Southeastern Ligurian Sea across coastal front



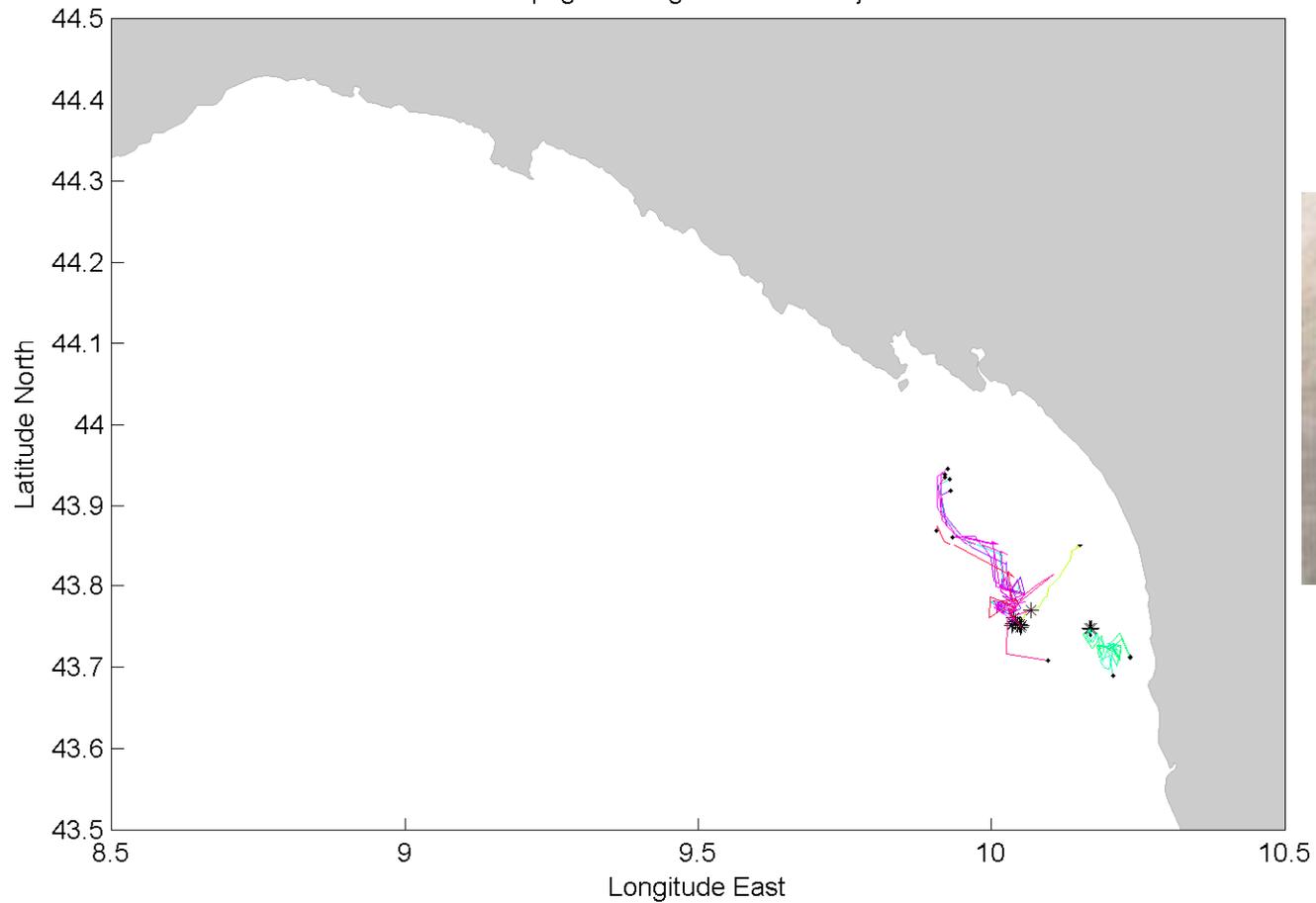
August deployments (0 day – 22 Aug)

Spaghetti diagram after 0 days



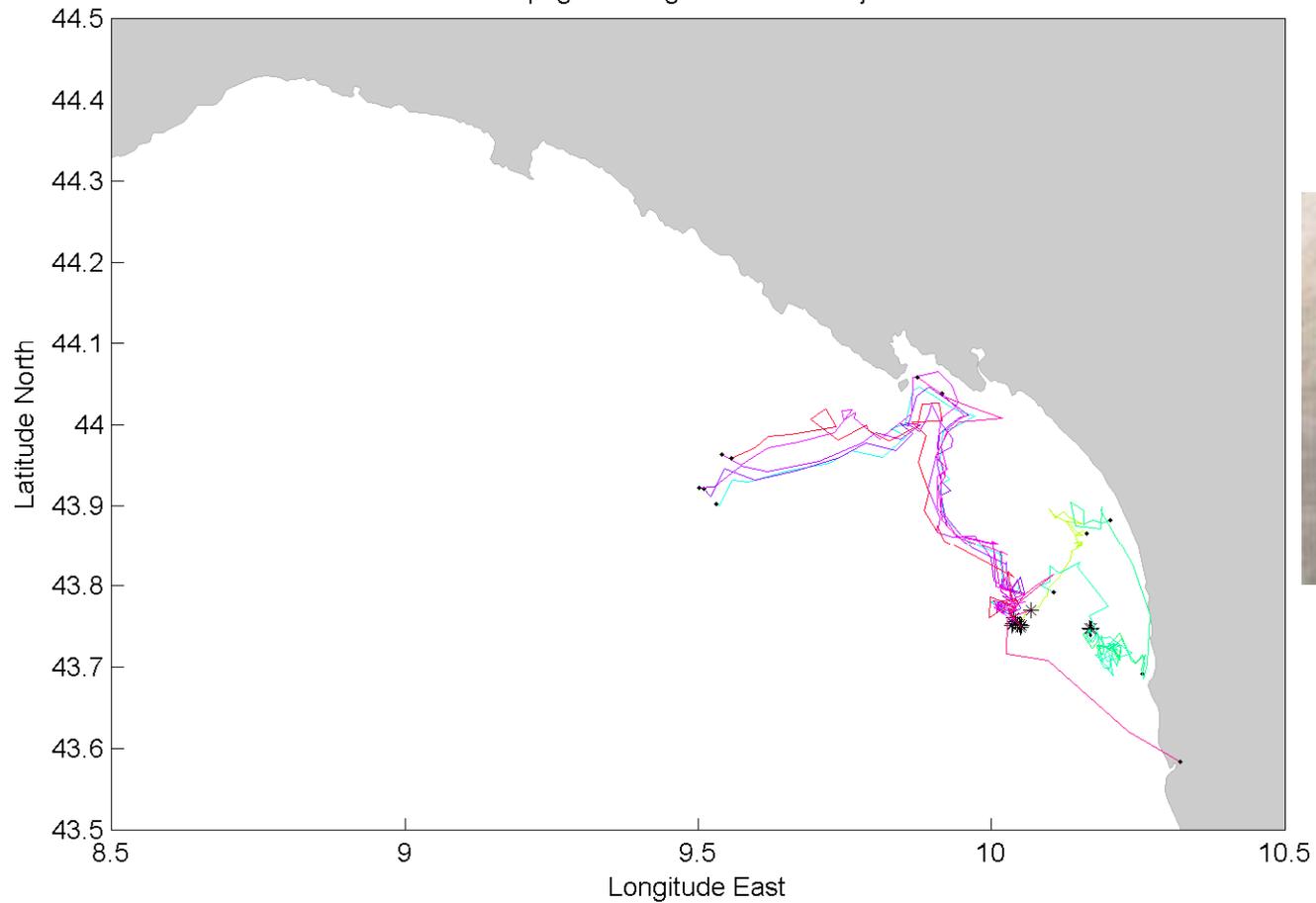
August deployments (5 days – 27 Aug)

Spaghetti diagram after 5 days



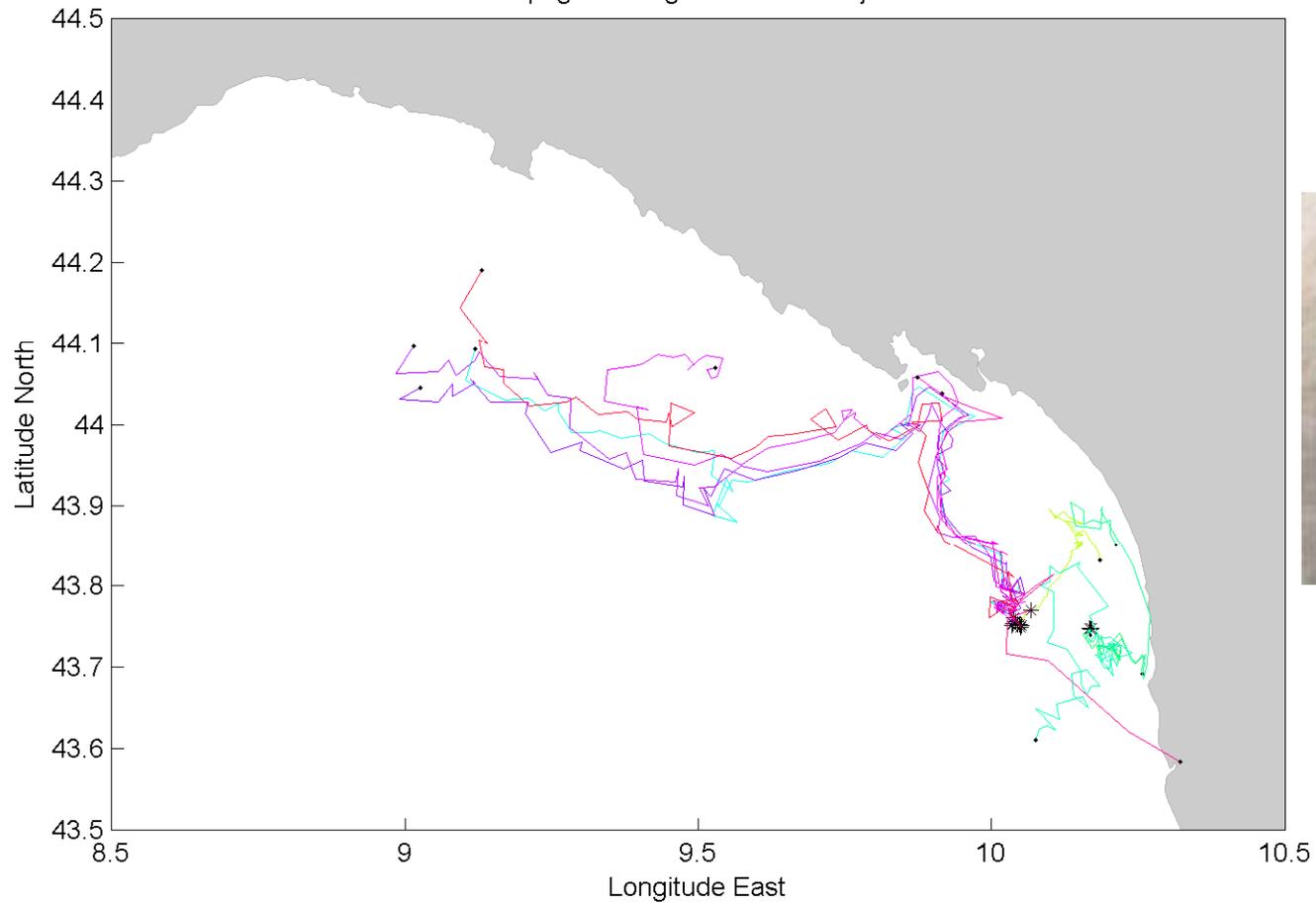
August deployments (10 days – 1 Sep)

Spaghetti diagram after 10 days



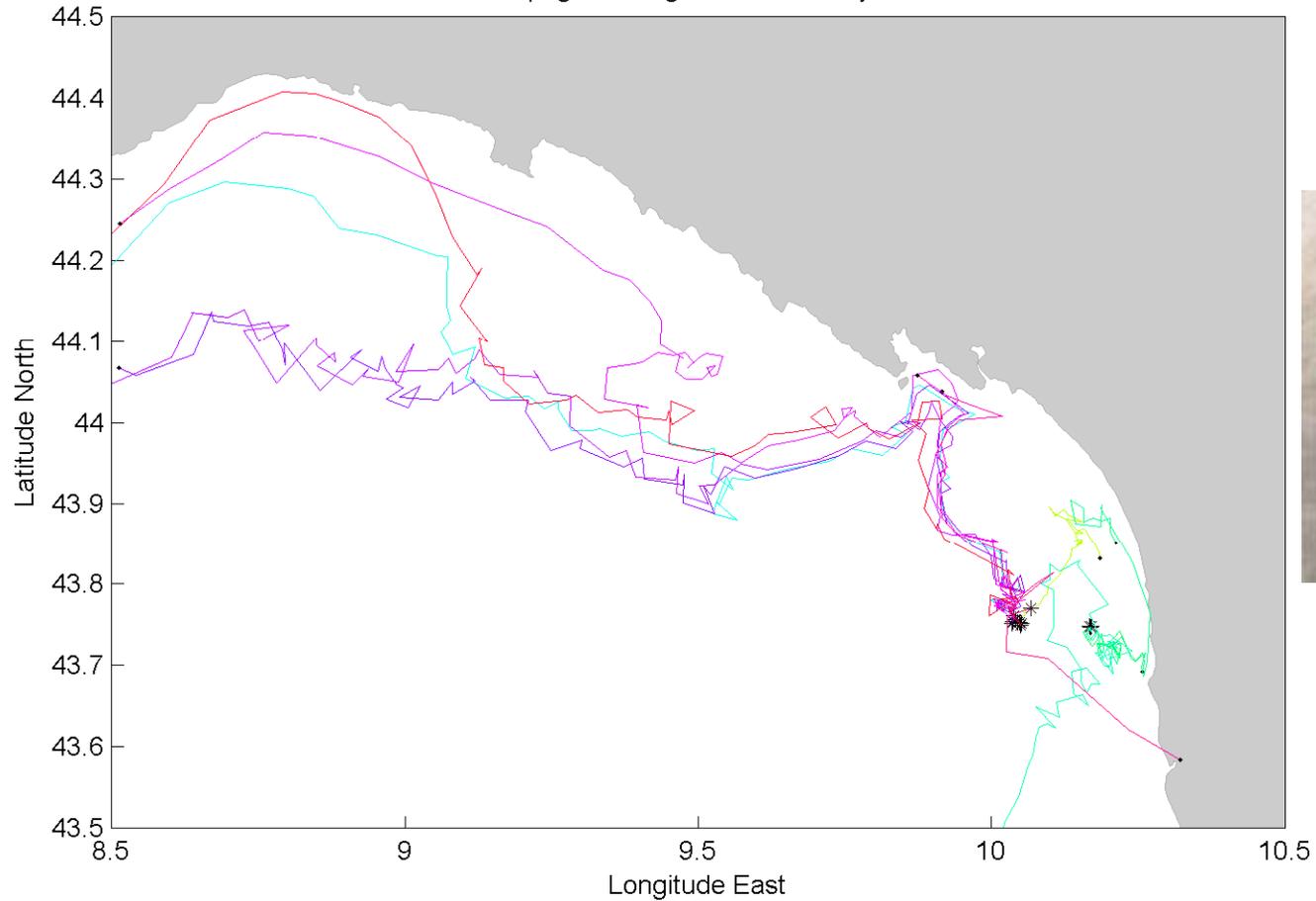
August deployments (15 days – 5 Sep)

Spaghetti diagram after 15 days

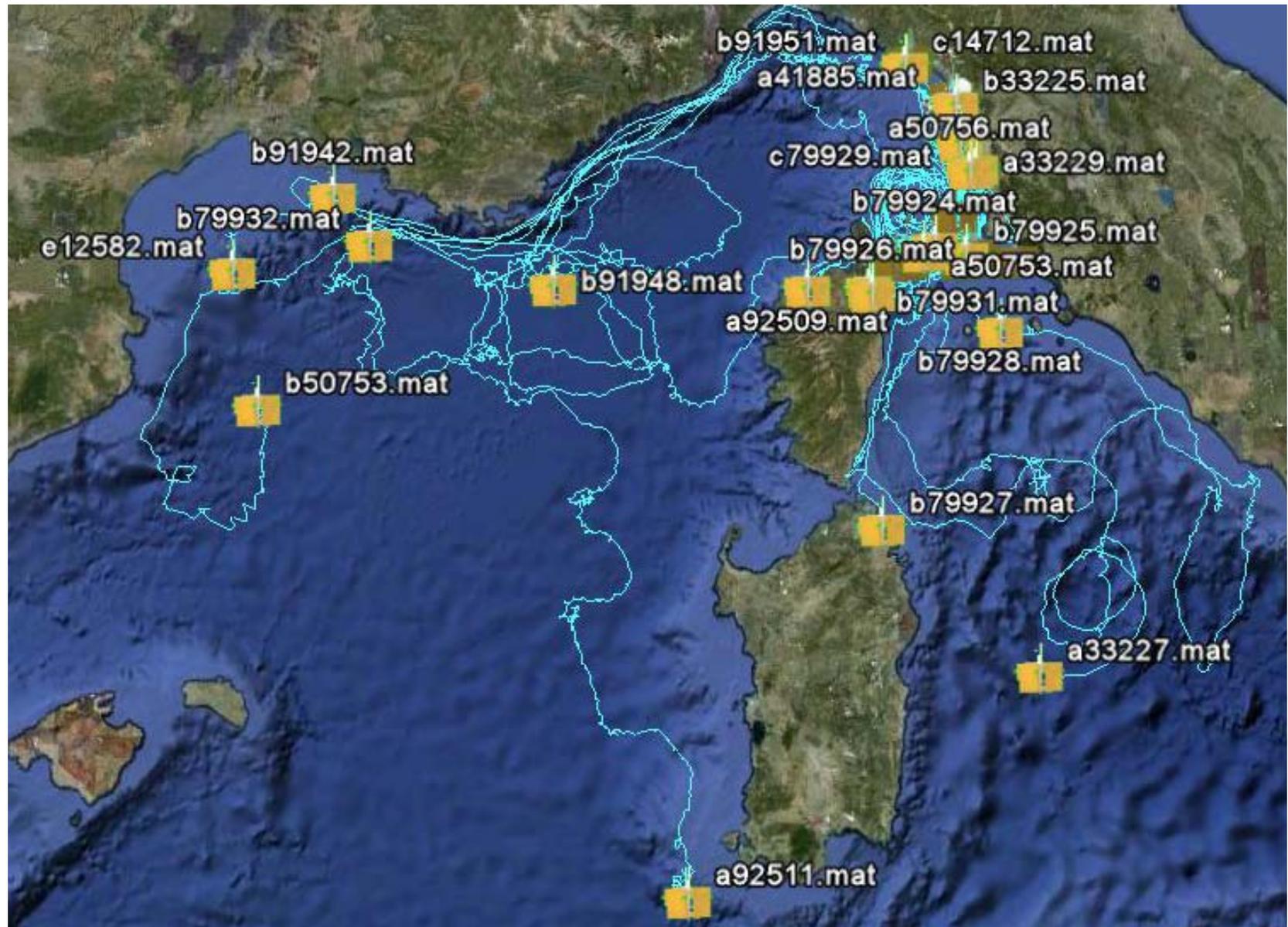


Aug deployments (20 days – 10 Sep)

Spaghetti diagram after 20 days



Where are the LIDEX10 drifters today? 7 units still alive!



Conclusions

Dispersion in coastal environment can be very complex:

- Need to quantify the dispersion, i. e., using advanced relative dispersion statistics ($\langle D^2 \rangle$ and FSLE).
- Need to improve models to try to forecast horizontal dispersion.

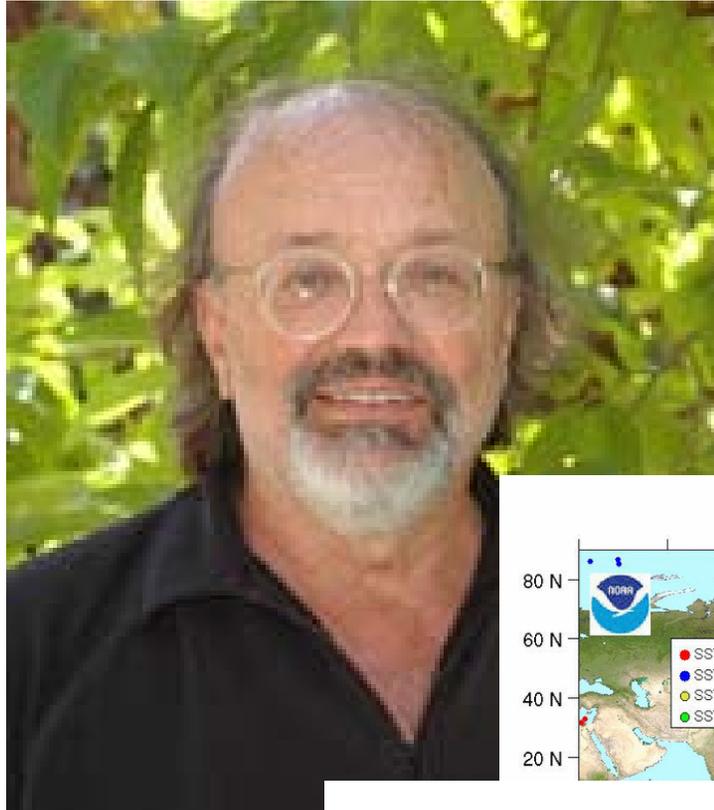
Acknowledgments

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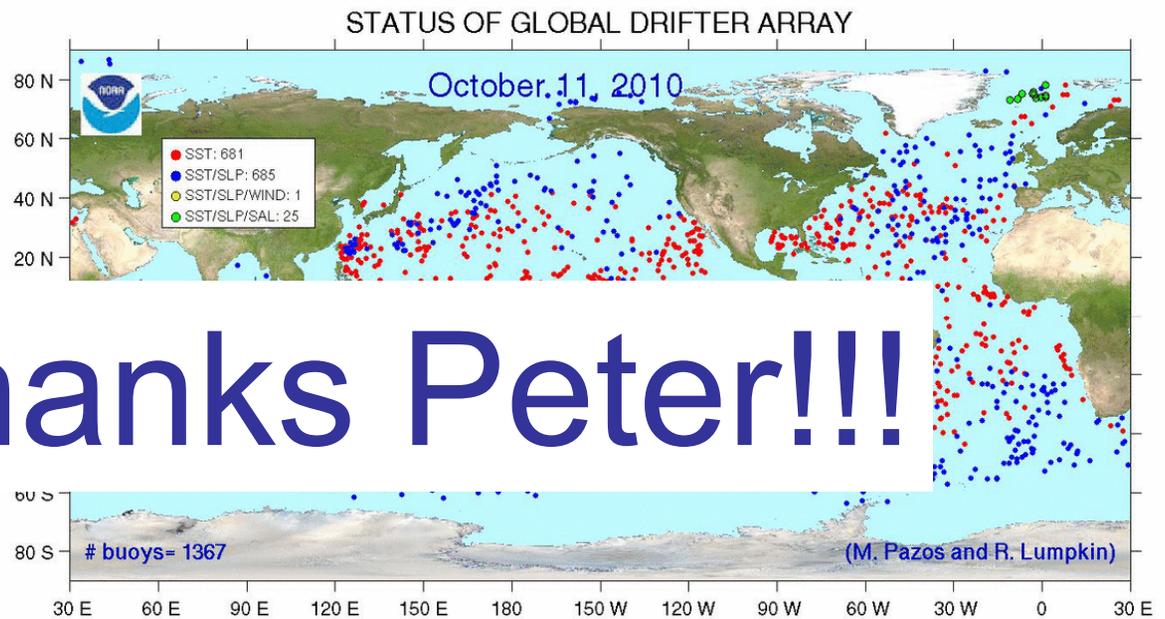
Pearn (Peter) P. NIILER

19 September 1937, Tartu, Estonia - 15 October 2010, San Diego, USA



➤ Prof. Emeritus of Physical Oceanography, Scripps Institution of Oceanography, UCSD

➤ Founder and Director of the Global Drifter Program



Thanks Peter!!!

