LOTUS WP 5.5

WP 5: Applications in value-adding ocean services

Task 5.5 - Climate change services (CLS)

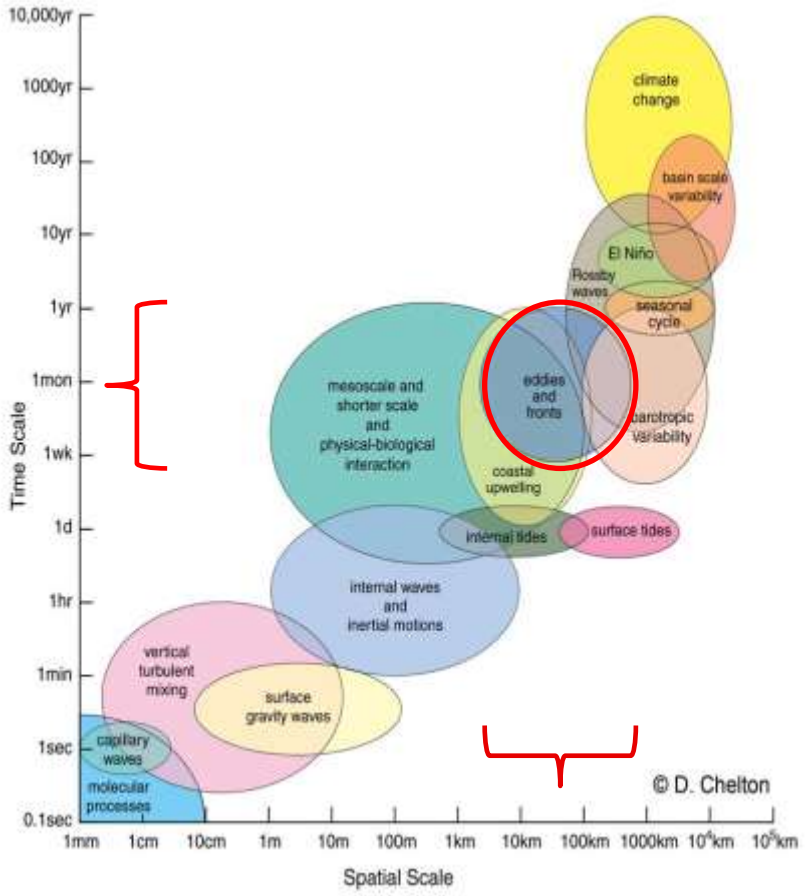
Report delivered **on January, 15th**

Eddy detection has been performed over the European Seas on the DUACS multi-mission L4 products

This study of coherent mesoscale structures shows how altimetric products can be used to identify and track eddies.

It illustrates how eddy identification and tracking, enlightened by eddy physics, can serve to evaluate altimetric products.

It outlines that eddy physics understanding and altimetric product improvement are two fields that enrich one another.



Schematic summary of the time and space scales of processes in physical oceanography [Chelton]

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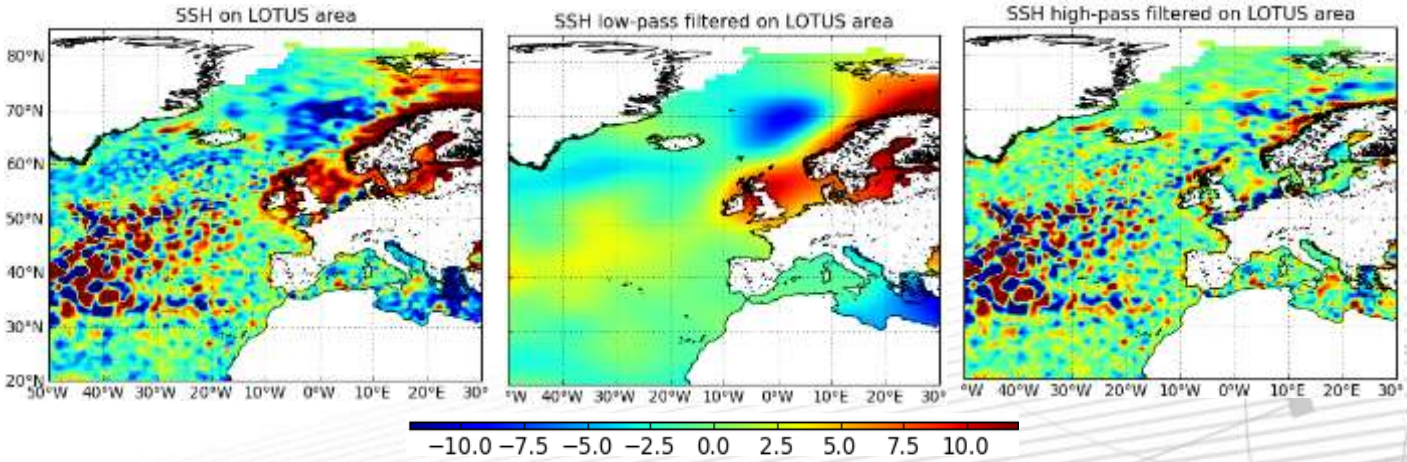
Different eddy identification methods based on altimetric data (mainly weekly 1/4° SSH maps) exist (Chaigneau et al.,2009; Dencausse et al.,2010;Chelton et al., 2011; Mason et al., 2014)

This study is based on Chelton et al., 2011: In order to optimize eddy study, large scale variations are removed to keep only spatial scales < 1000 km (high pass filtering)



AVISO SSH map of 1993/01/01. (1) Sea Surface Height (SSH) map over the LOTUS area; (2) SSH map (1) after low-pass filtering with half-power filter cutoffs of 20° of longitude by 10° of latitude; (3) high-filtered SSH map obtain by subtracting map (2) to map (1).

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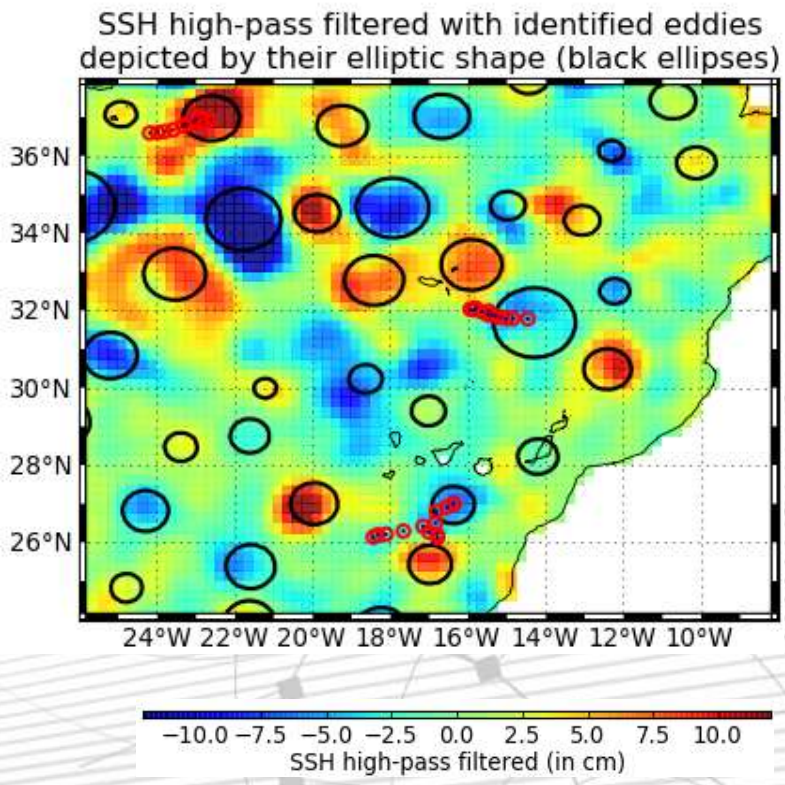
The method works as follows:

- A detection of the local maxima on the high-pass filtered SSH map. Each maximum defines the center of an eddy.
- eddy radius = radius of a circle whose edges reach a reversed slope.
- eddy amplitude =difference between its center height and the mean height at the edge of its radius circle.
- Eddy orientation (cyclonic, anticyclonic) and rotation speed are estimated with a speed map computed by differentiation of the high-pass filtered SSH map.
- Tracking process = following the path of each eddies along time by pairing eddies from a map to another.



High-filtered SSH map of 1993/01/01
• Identified eddies (black circles);
• Tracking of the centers of 3 eddies during 3 months

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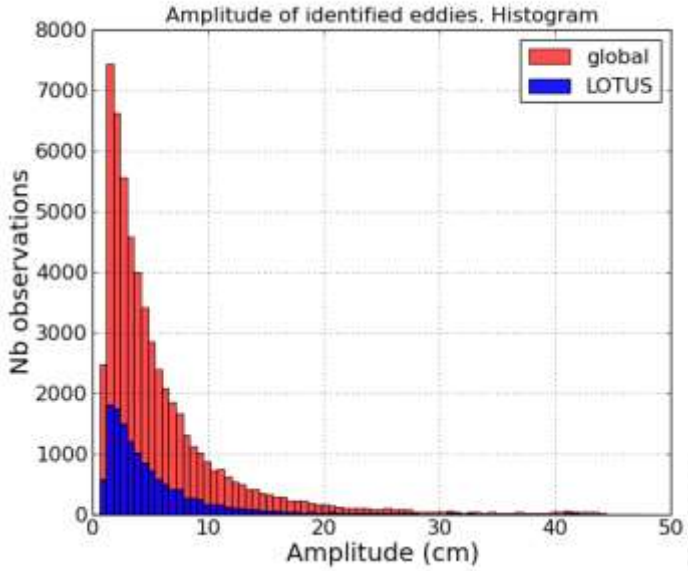
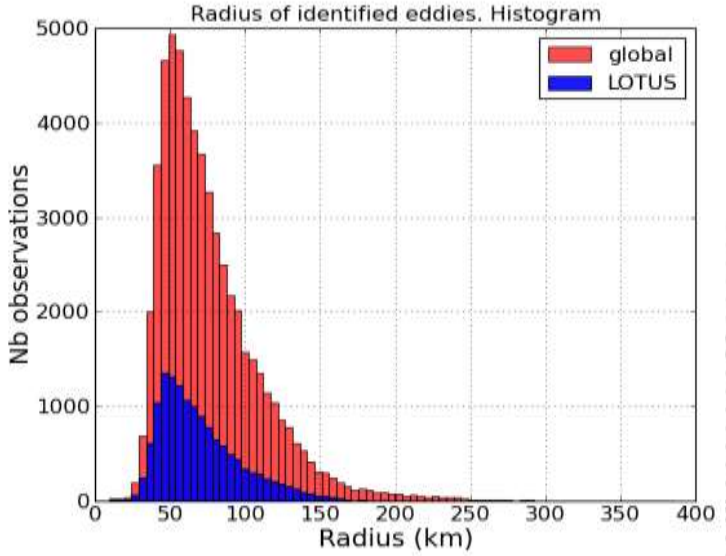
eddy detection statistics over European Seas





Over European Seas, smaller-amplitude & smaller-size eddies vs. global distribution

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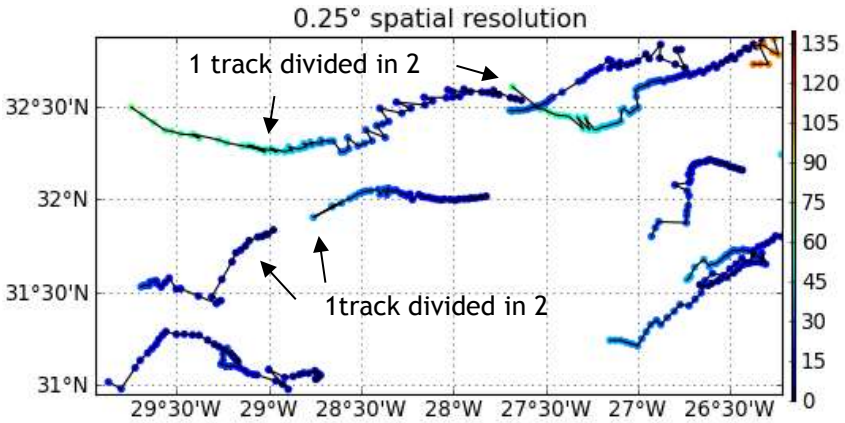
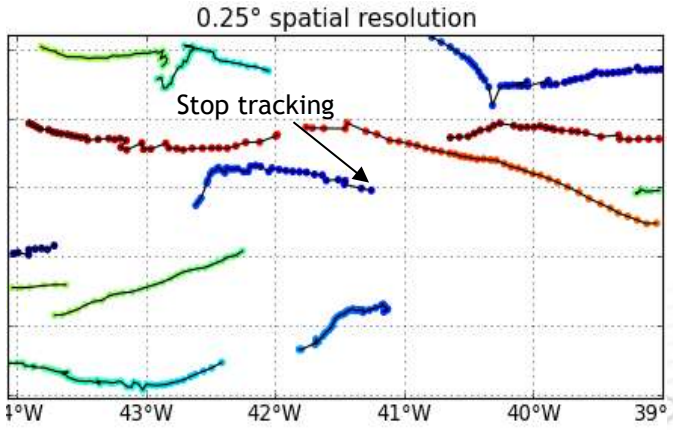
in color =time from tracking start

Impact of HR grids on eddy tracking

1/4°





1/8°