Surface Current Monitoring over Gulf Stream, Agulhas and North Brazilian Current

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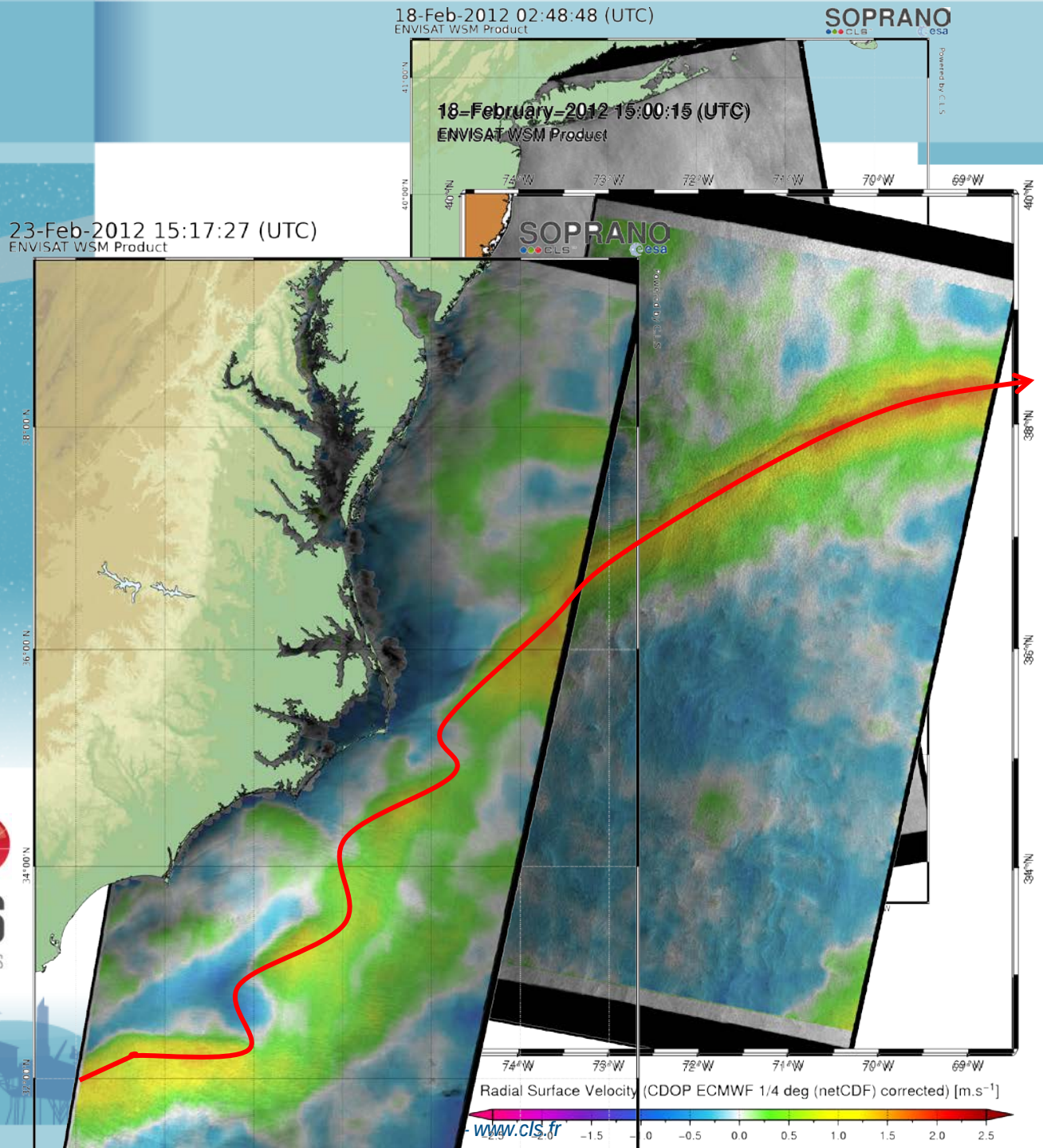

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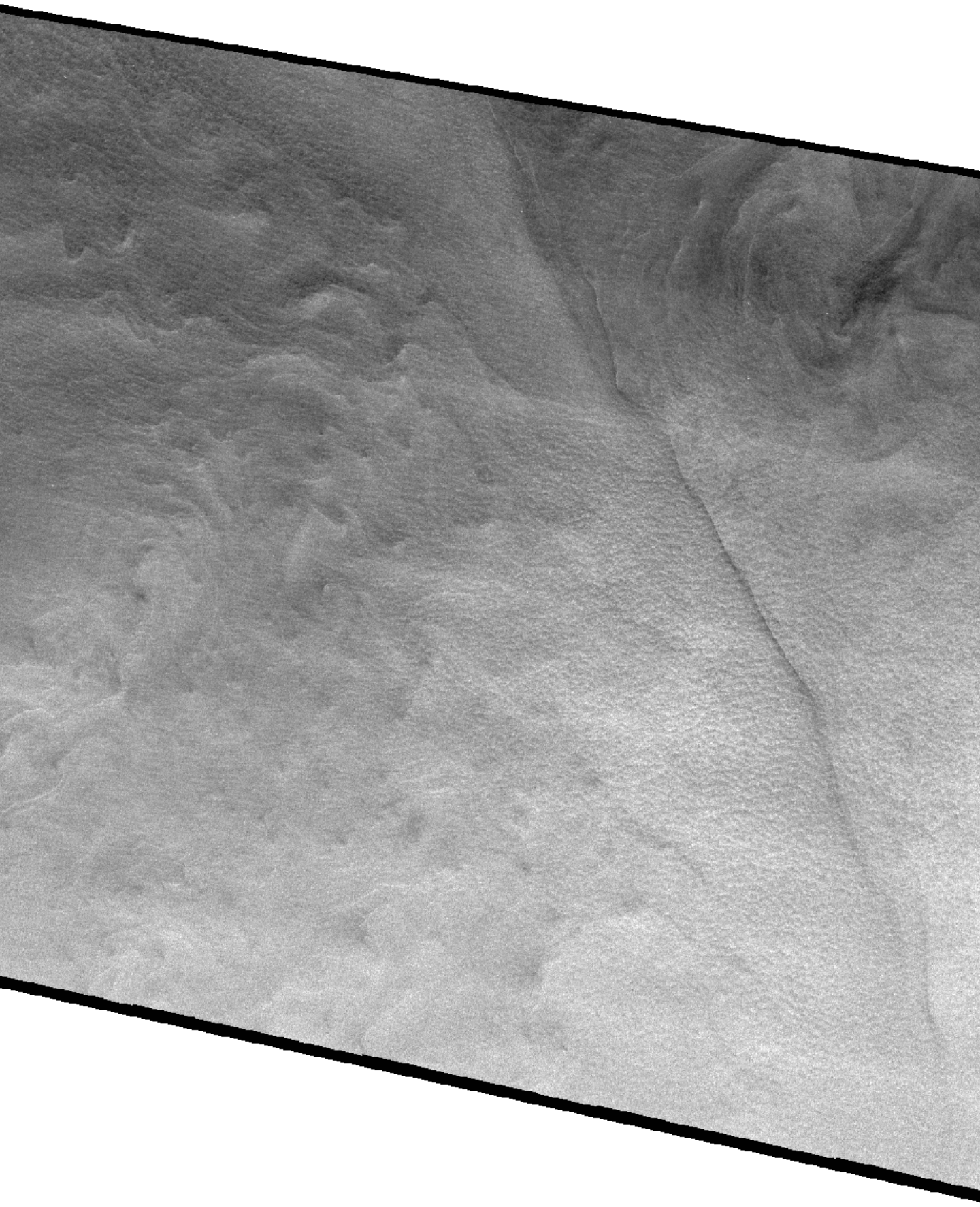
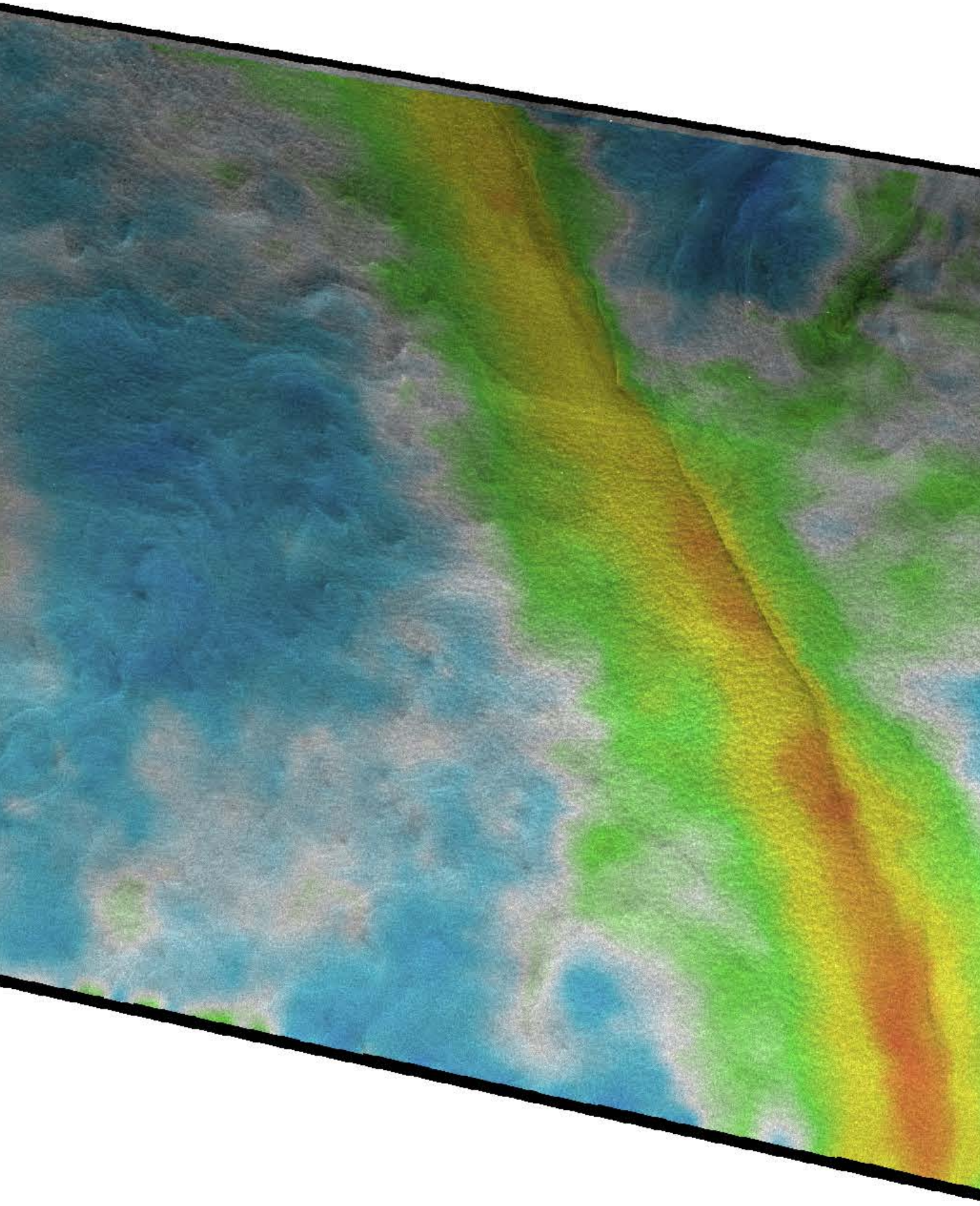

36°N
38°N


36°N
38°N

Doppler shift contributions

Observed Doppler velocities = underlying current + background sea state + sea state perturbations by surface current.

First order : only underlying current + background sea state

Hypothesis based on Doppler observation compared to HF radar except in area where tidal current is fast changing due to interaction with bathymetry :

Second order : sea state perturbated by surface current. Advanced models such as Doprim are needed to take into account modification of wave spectrum by surface current gradients.

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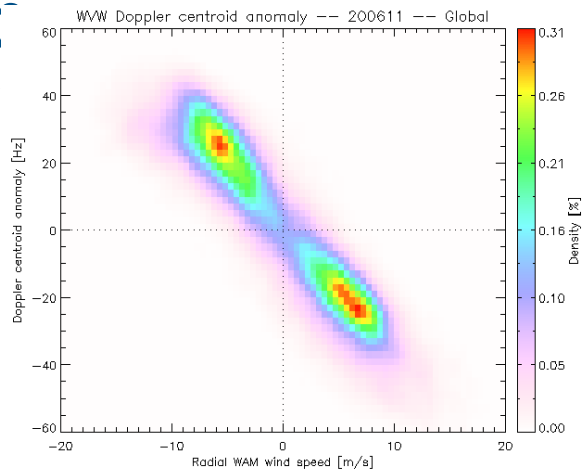
CDOP geophysical model function

First presented at ENVISAT Cal-Val review in 200[illegible] published in JGR 2005 using wave mode at 23 incidence angle.

In TGRS 2012 using ASAR wide swath across various incidence angles and polarisations



First order : only wind dependance

empirical law only based on wind speed and direction relative to radar look

Neural Network training

CDOP_23 = f(wind speed/direction)

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Gulf stream, Agulhas current, North brazil current monitoring demonstration

Supersites for systematic acquisition and processing of ASAR Wide Swath scenes (400km width)

data available on soprano.cls.fr (current section)

in average 2 pass over the same area every 3 days at mid latitude

Gulf stream (North Carolina)

Agulhas current

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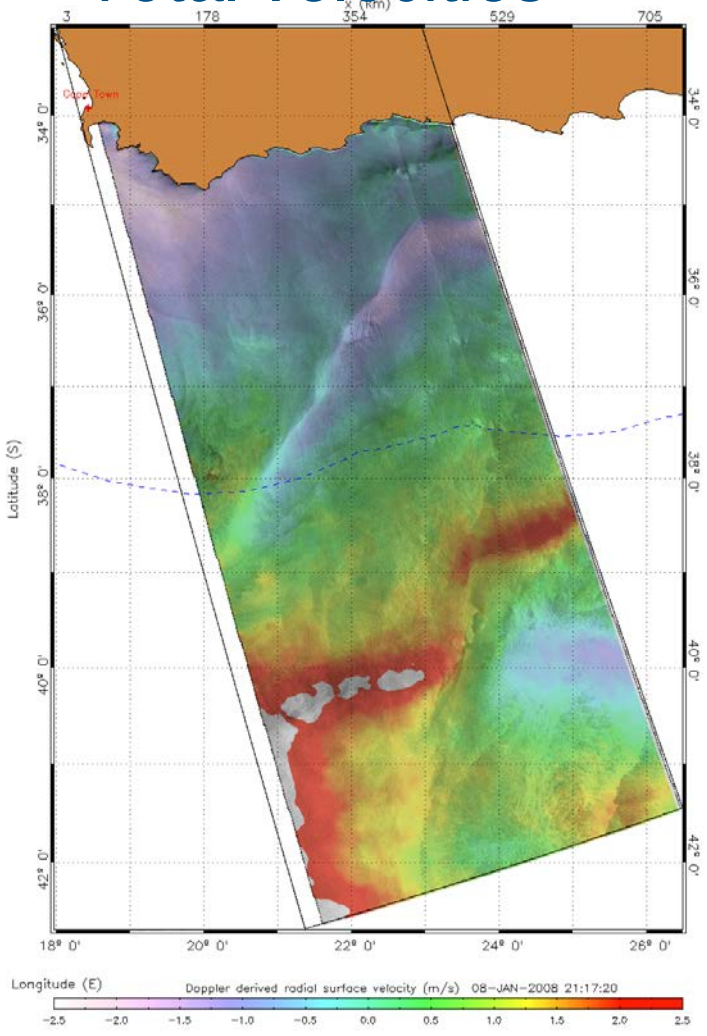
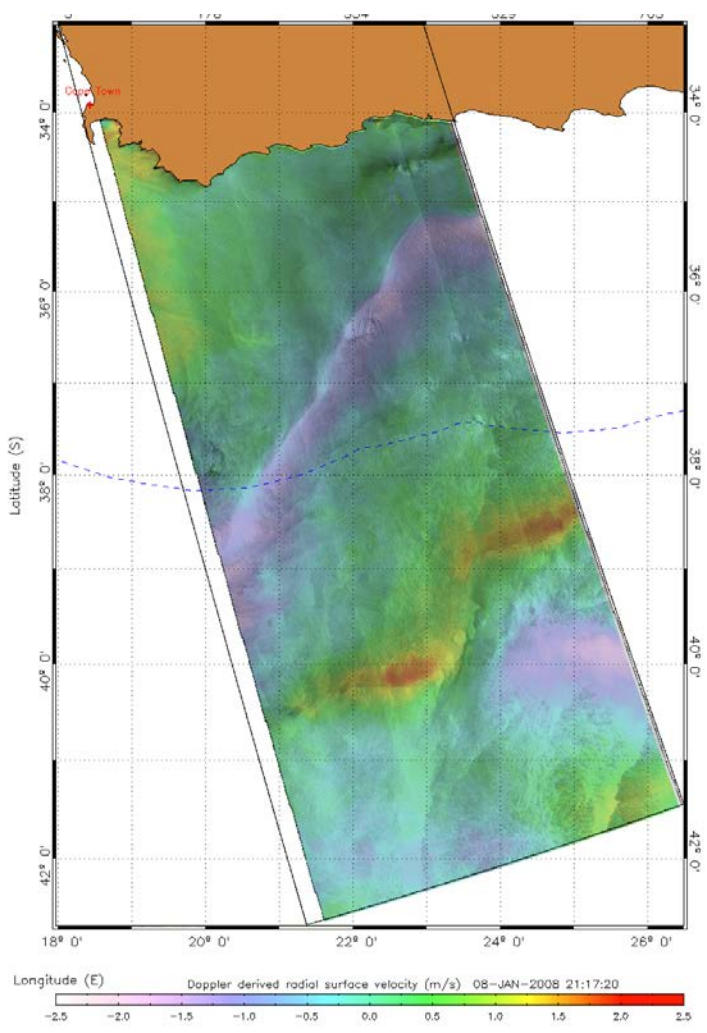
CDOP sea state correction (Mouche et al TGRS 2012)

Total velocities



Residual velocities



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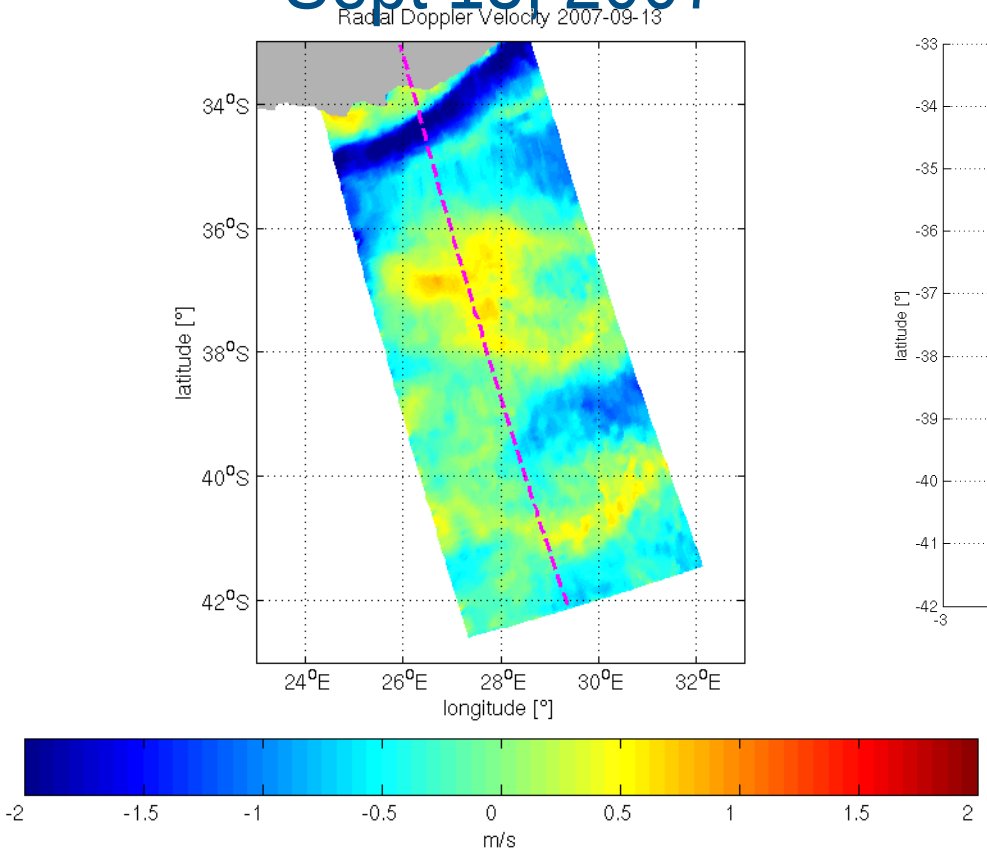
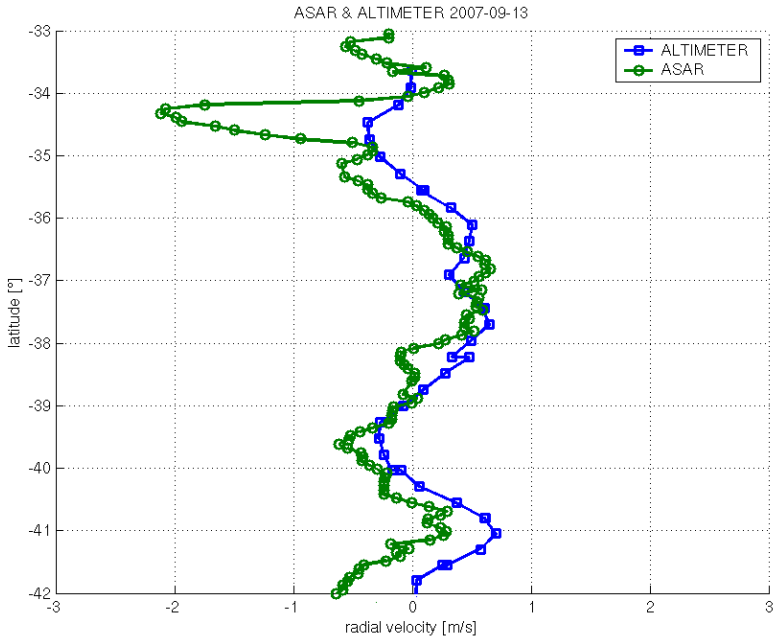
Comparison with altimetry

Sept 13, 2007





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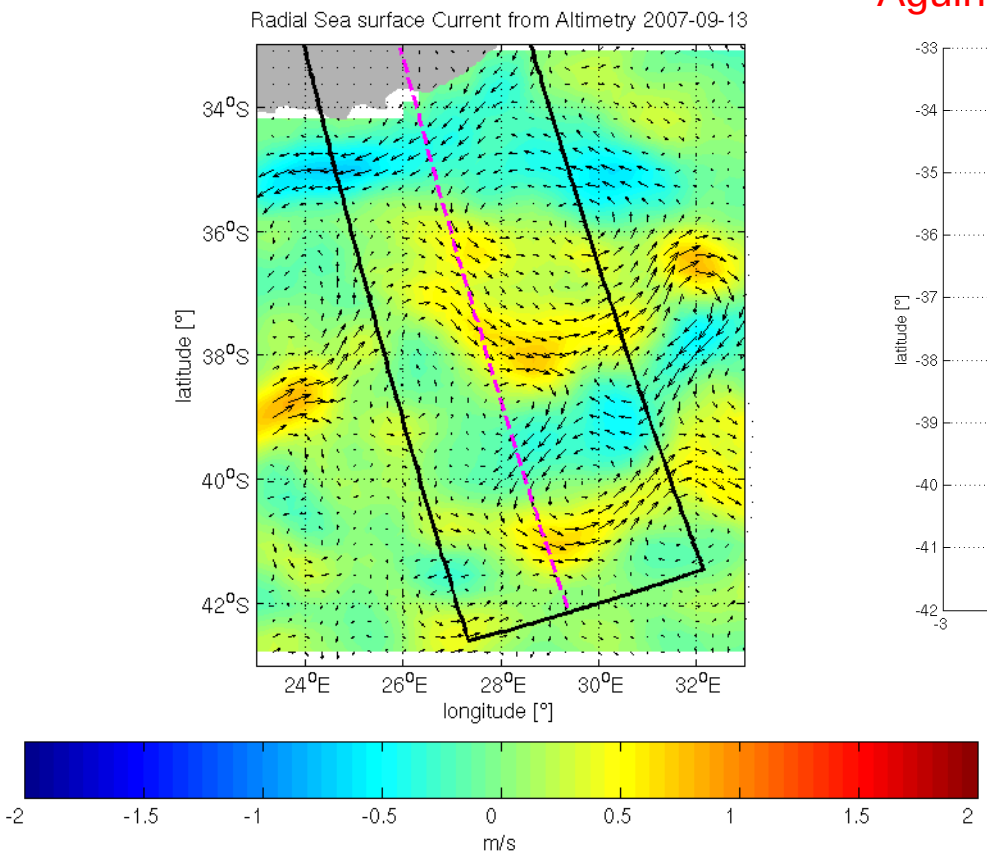
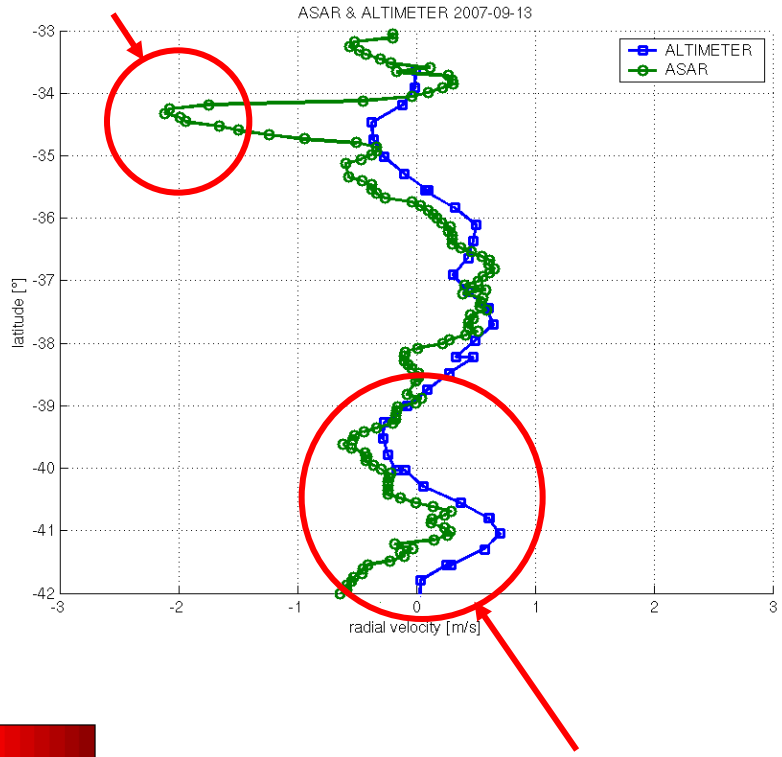
Comparison with altimetry



Agulhas main stream



Mesoscale eddie

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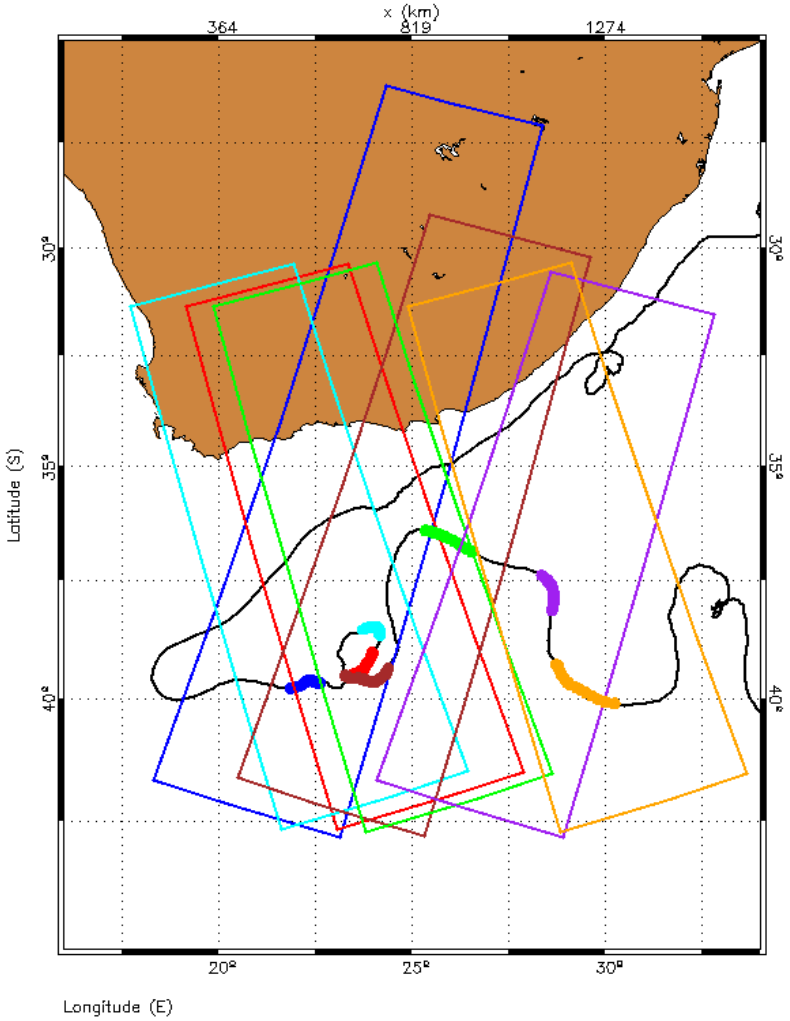
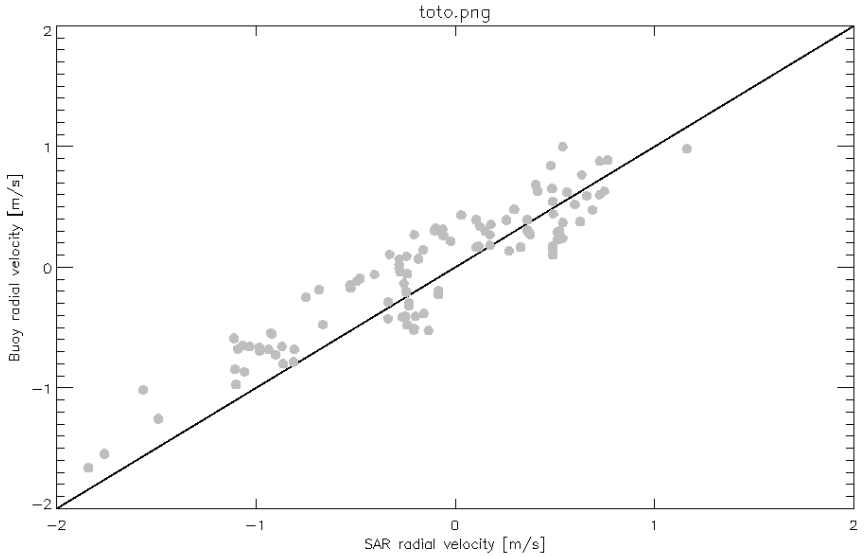
Comparison with a lagrangian drifter (15m depth)





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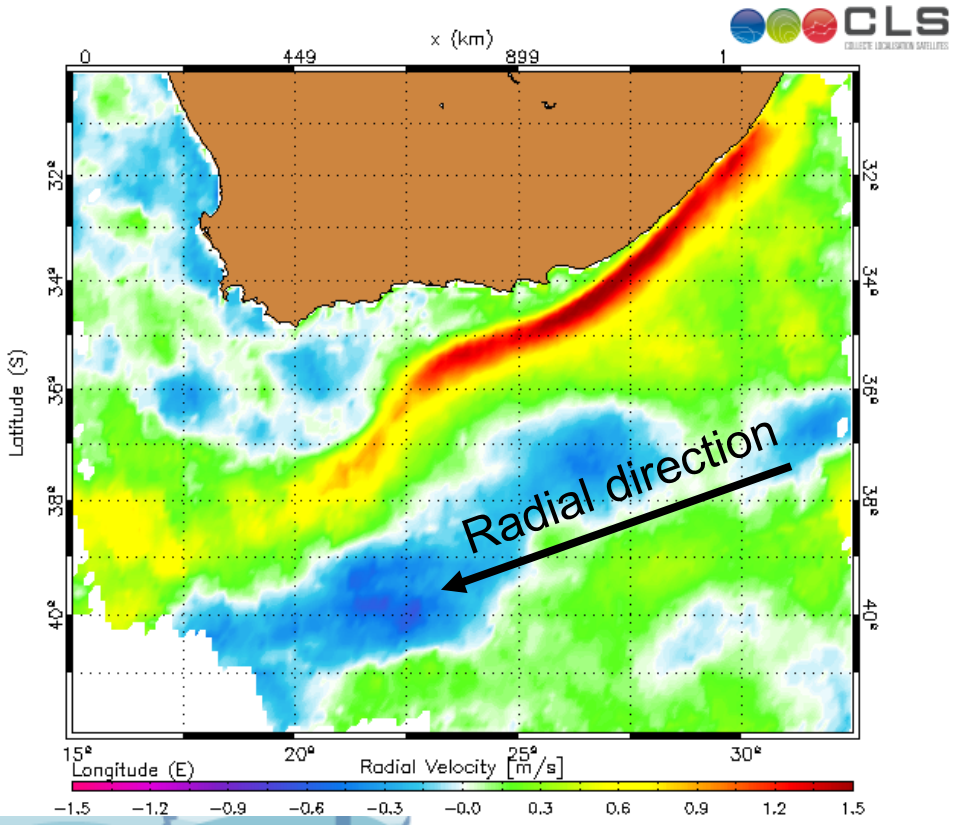
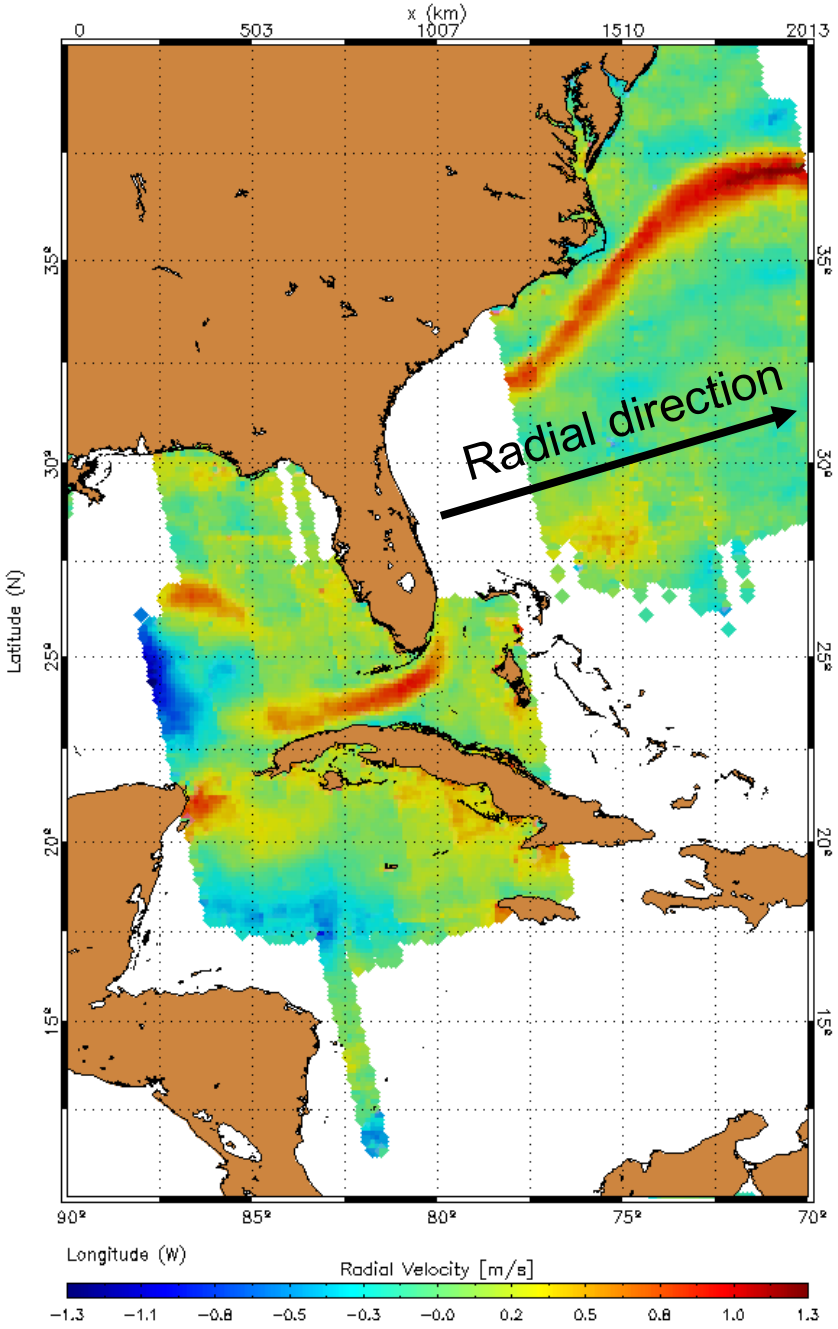
Annual mean over Agulhas and Gulf stream using ASAR Wide swath ascending tracks





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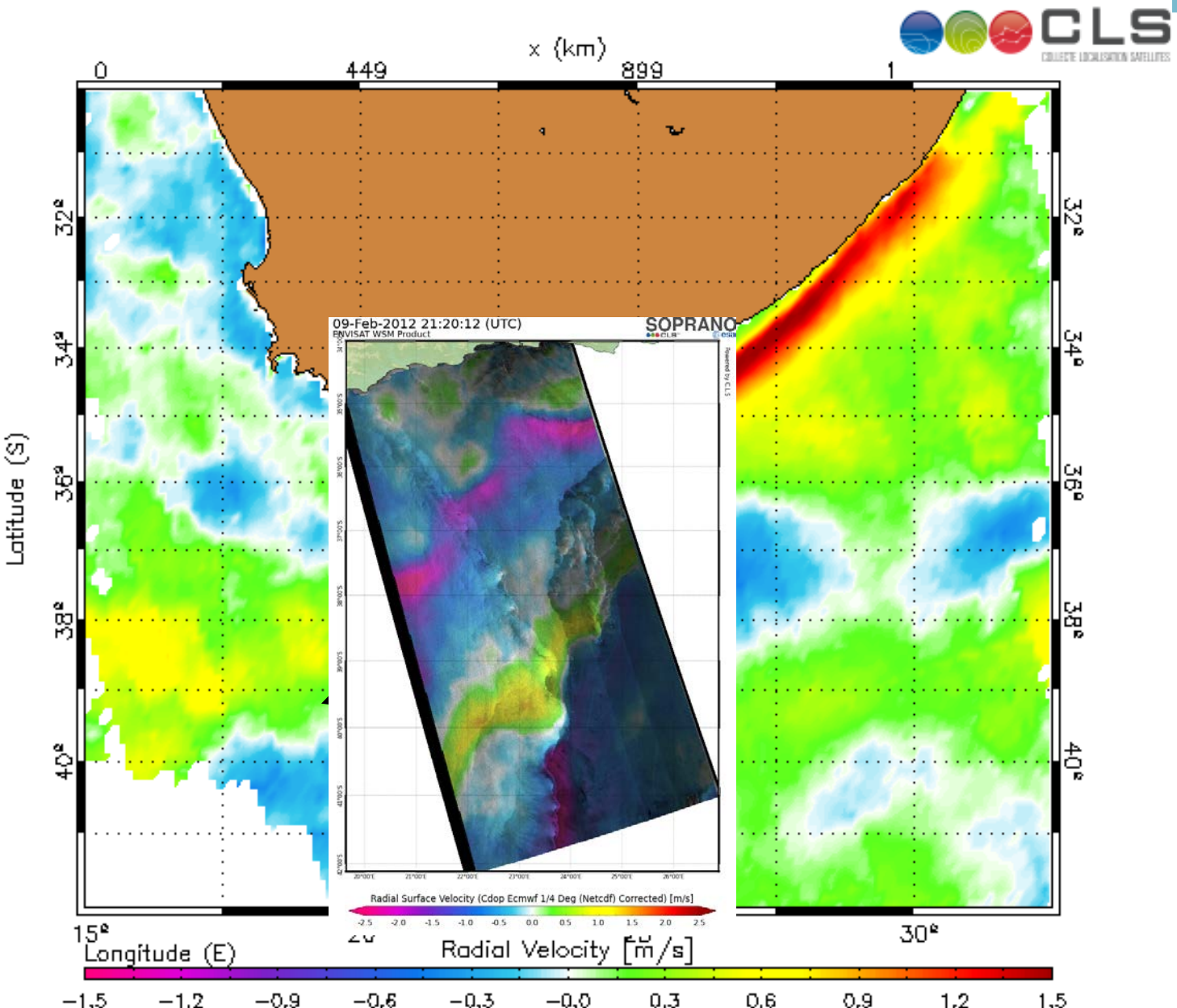
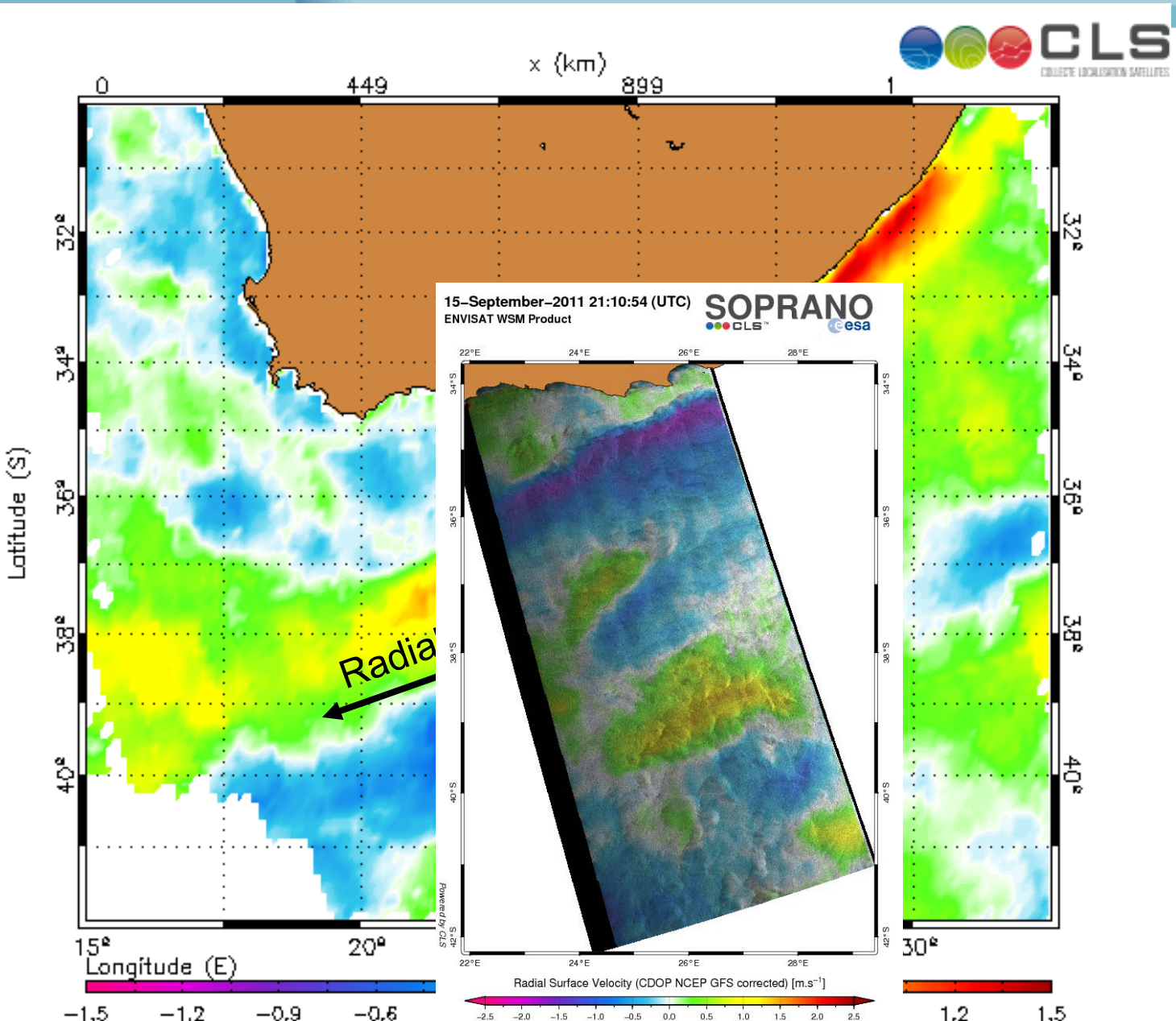
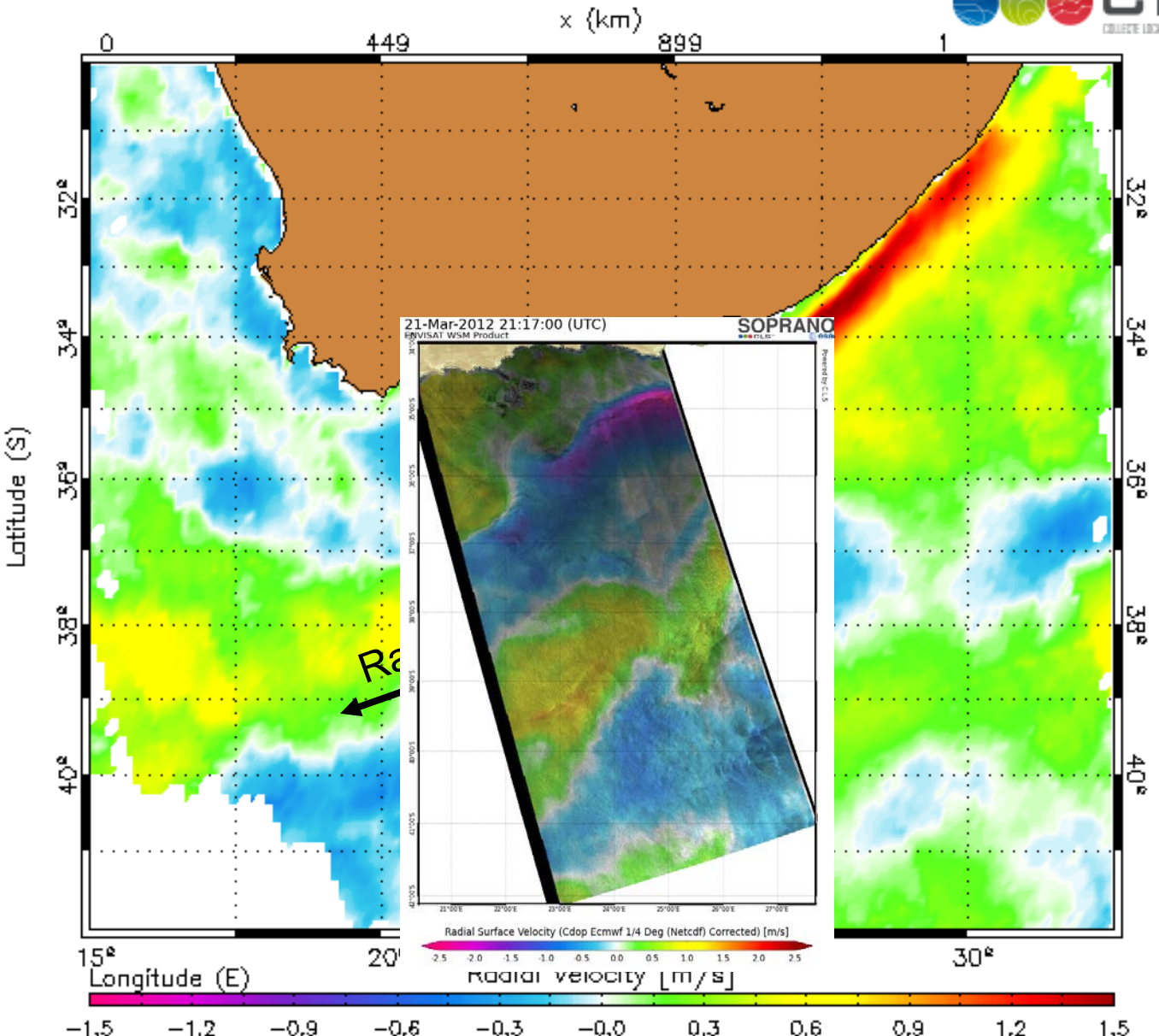
Anomalies from mean current



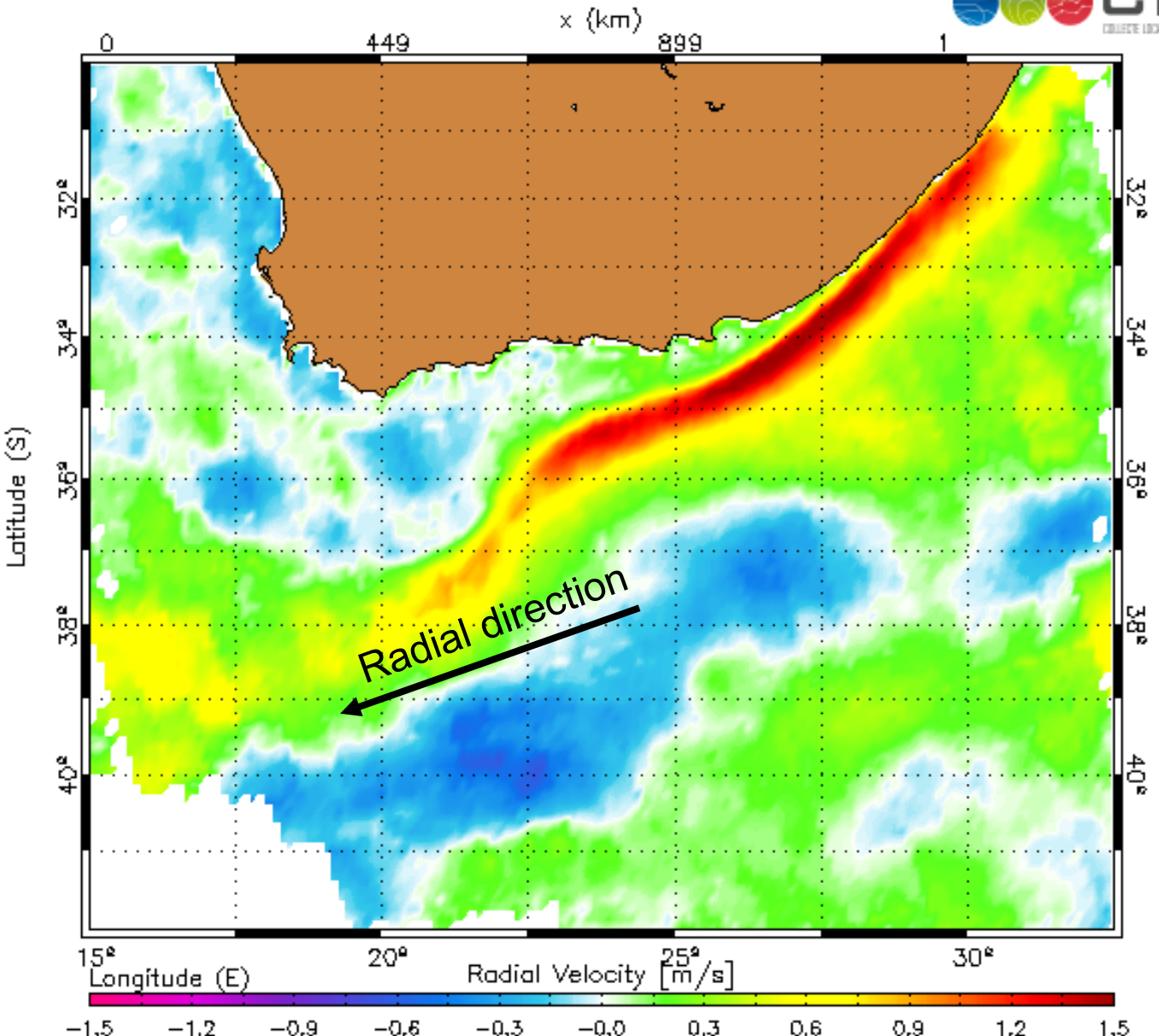
Anomalies from mean current

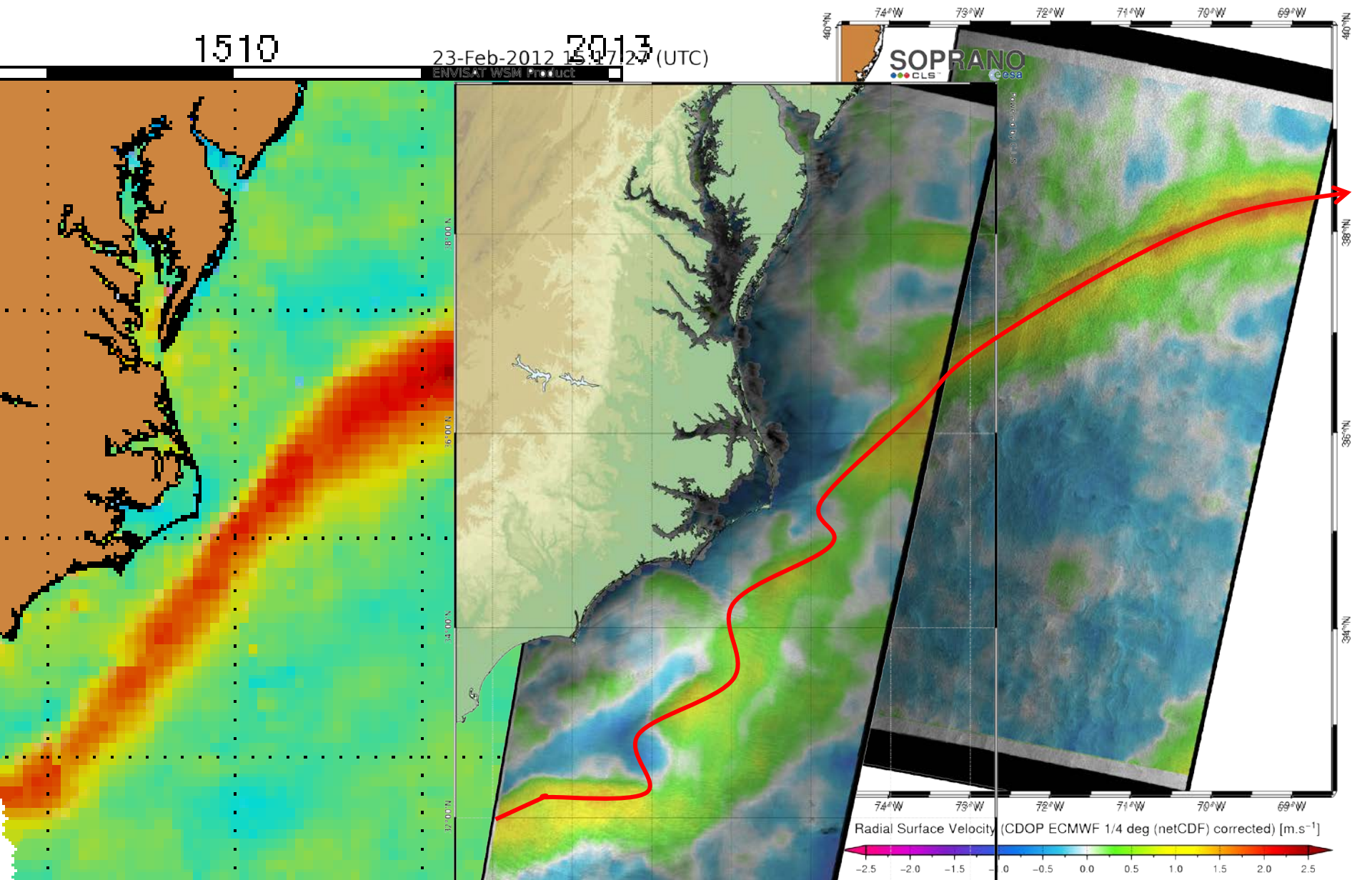


Anomalies from mean current

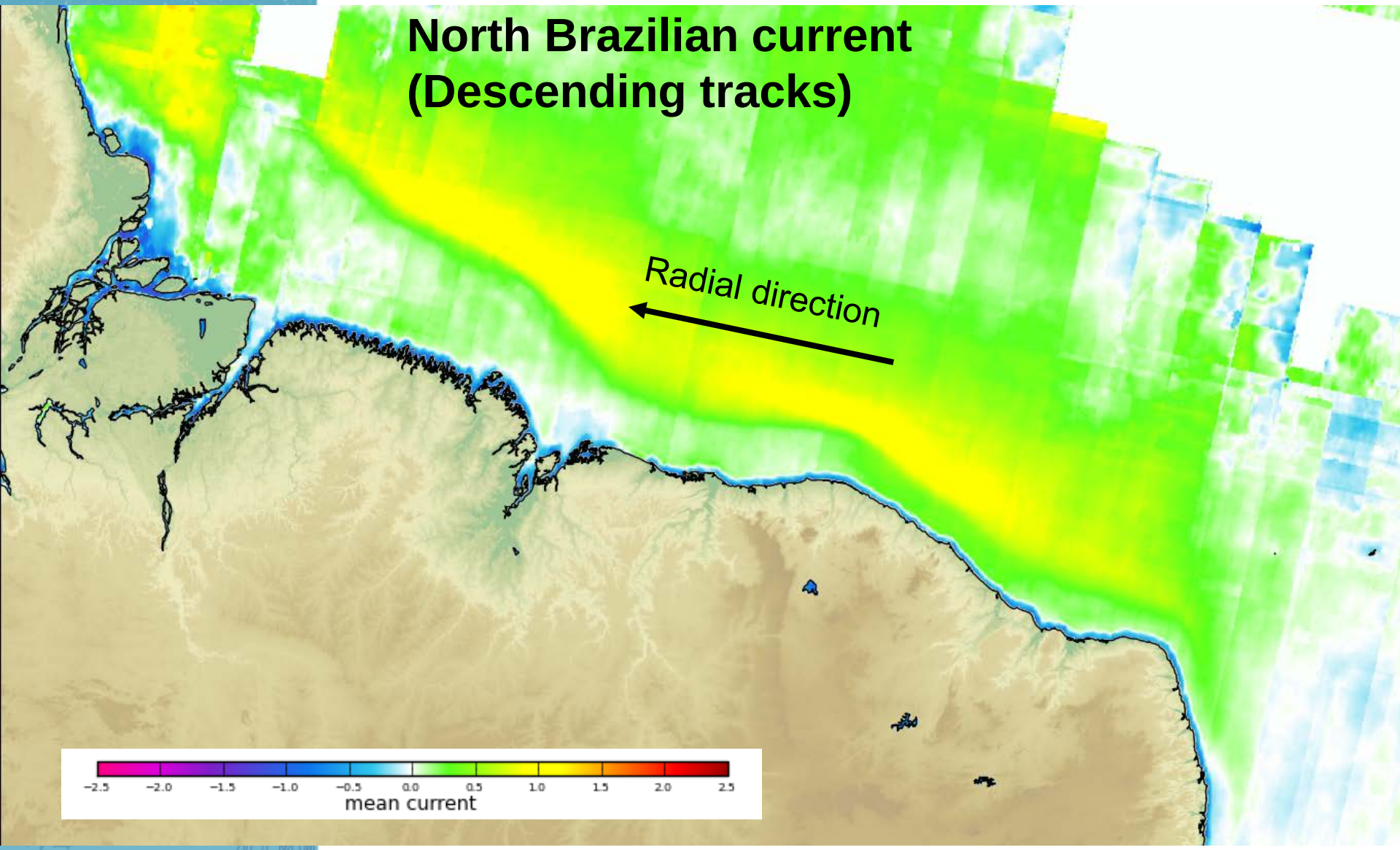


Anomalies from mean current




1510
2013
23-Feb-2012 15:17:24 (UTC)
ENVISAT WSM Product
SOPRANO
CLS
esa
74°W
73°W
72°W
71°W
70°W
69°W
40°N
38°N
36°N
34°N
Radial Surface Velocity (CDOP ECMWF 1/4 deg (netCDF) corrected) [m.s⁻¹]
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5

North Brazilian current (Descending tracks)



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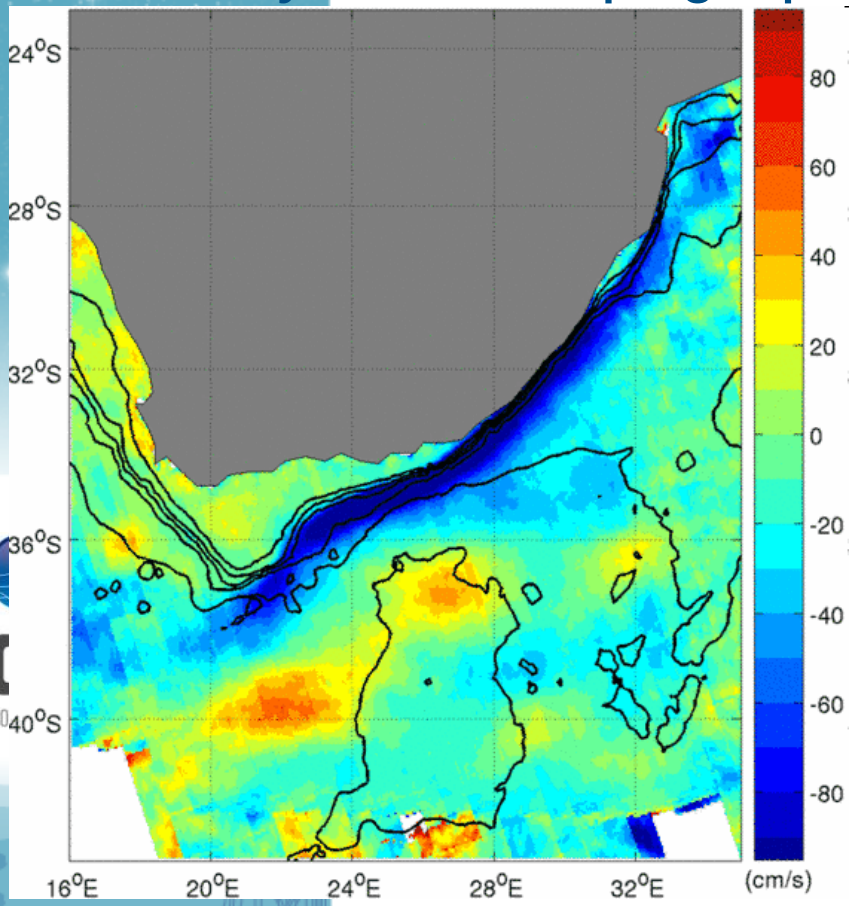
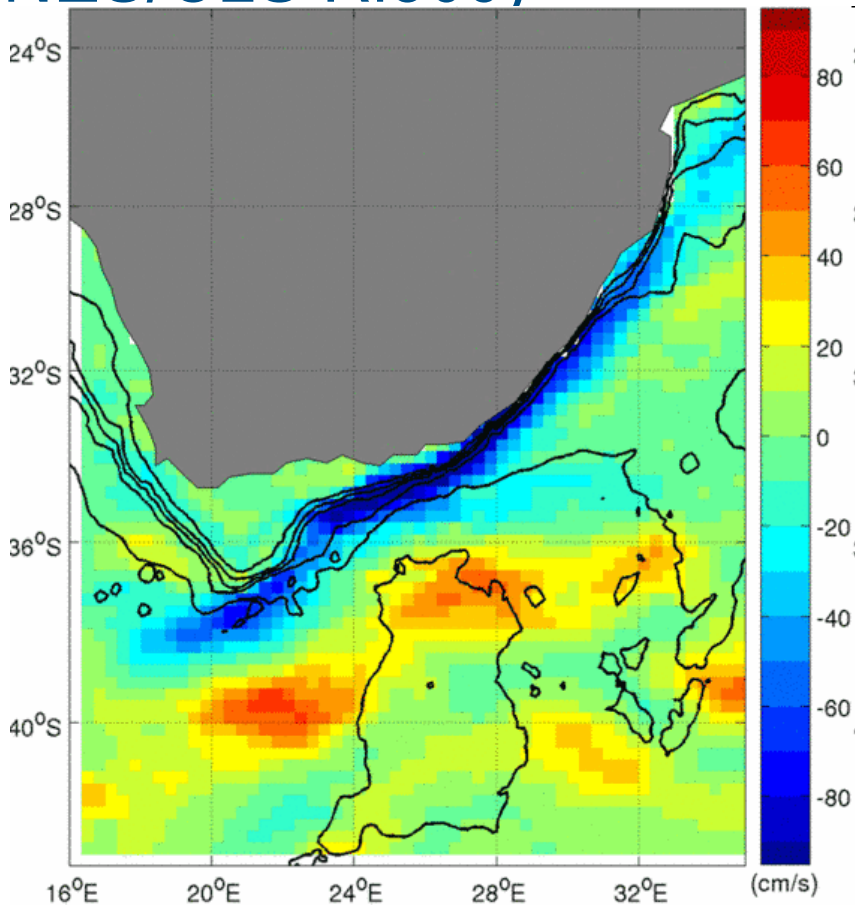
Mean radial velocity of the Agulhas current by ASAR on Envisat (left, 2007-2009 mean) and by altimetry (right, Mean Dynamic Topography CNES/CLS Rio09)





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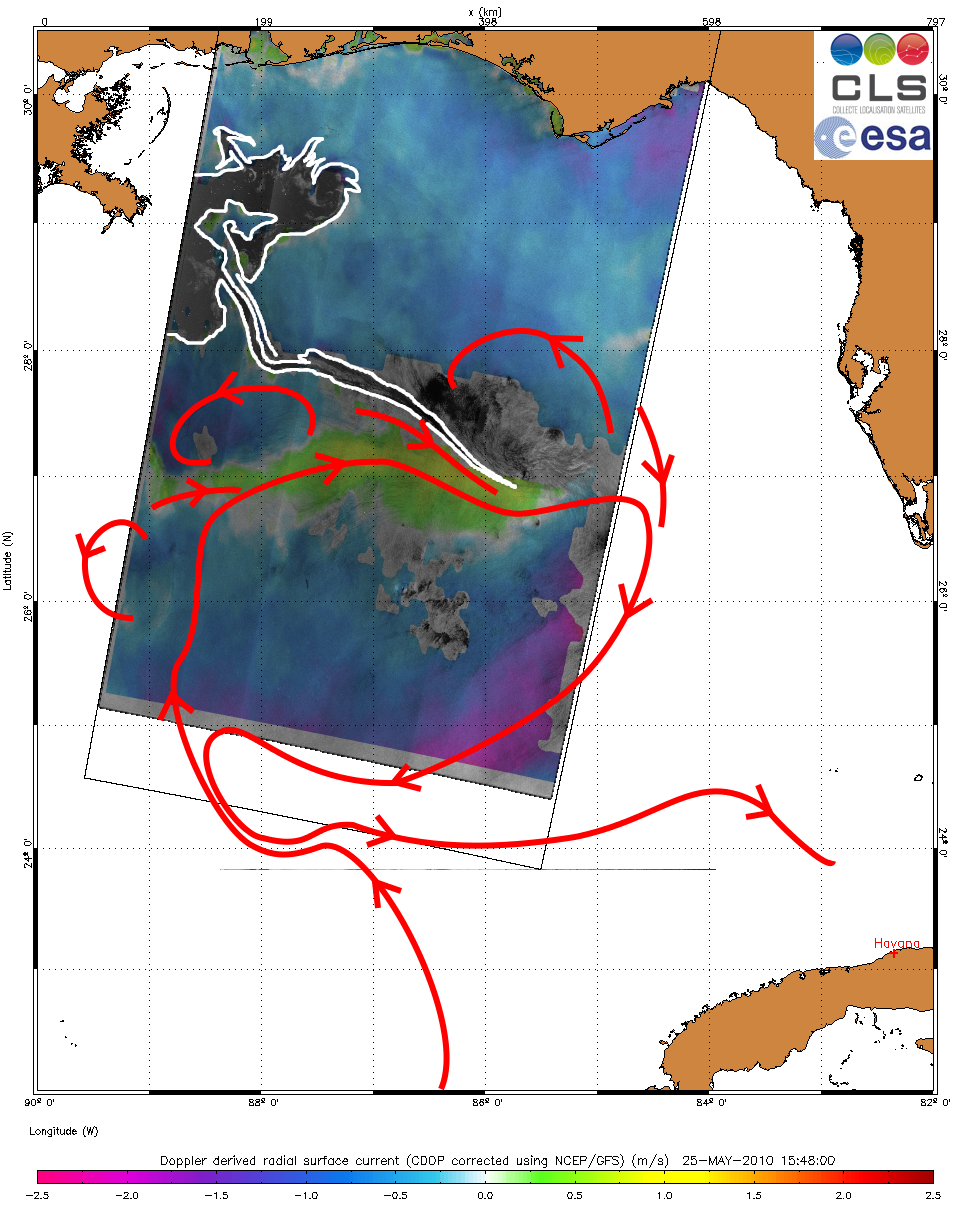
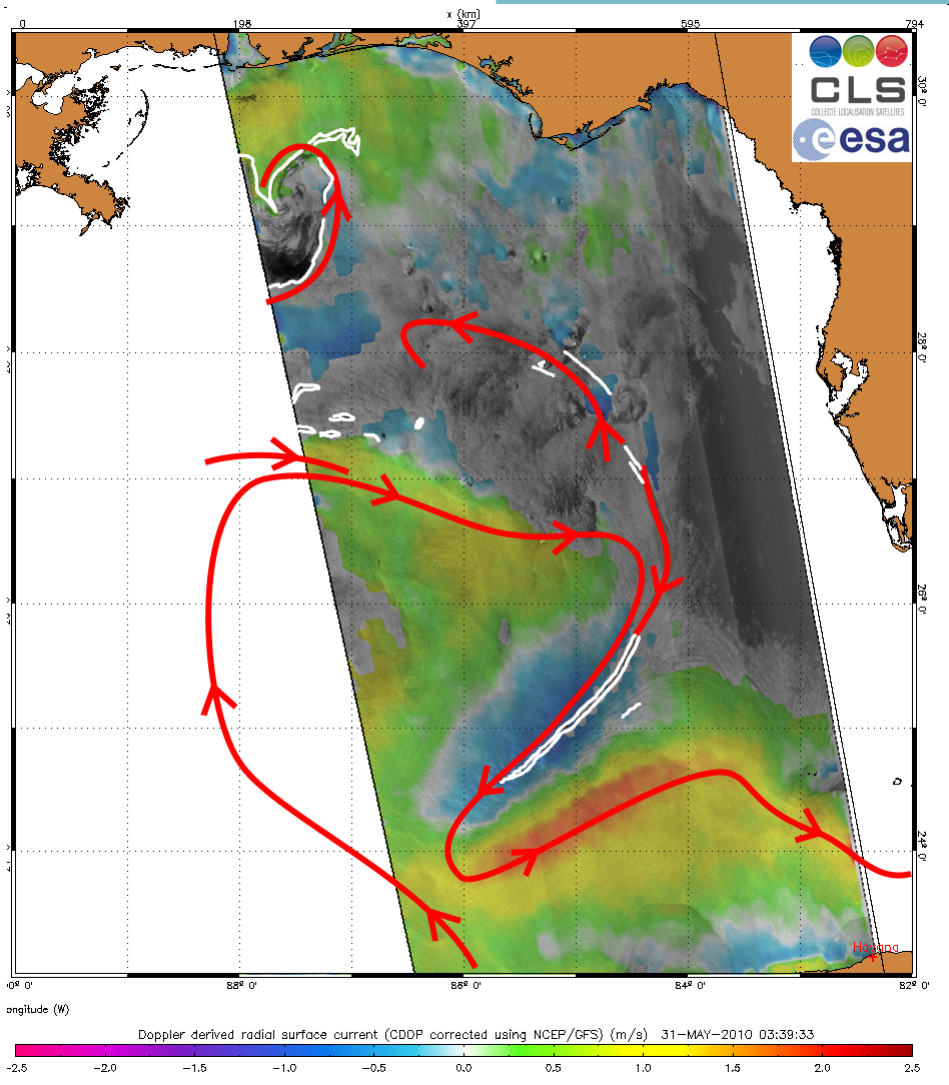
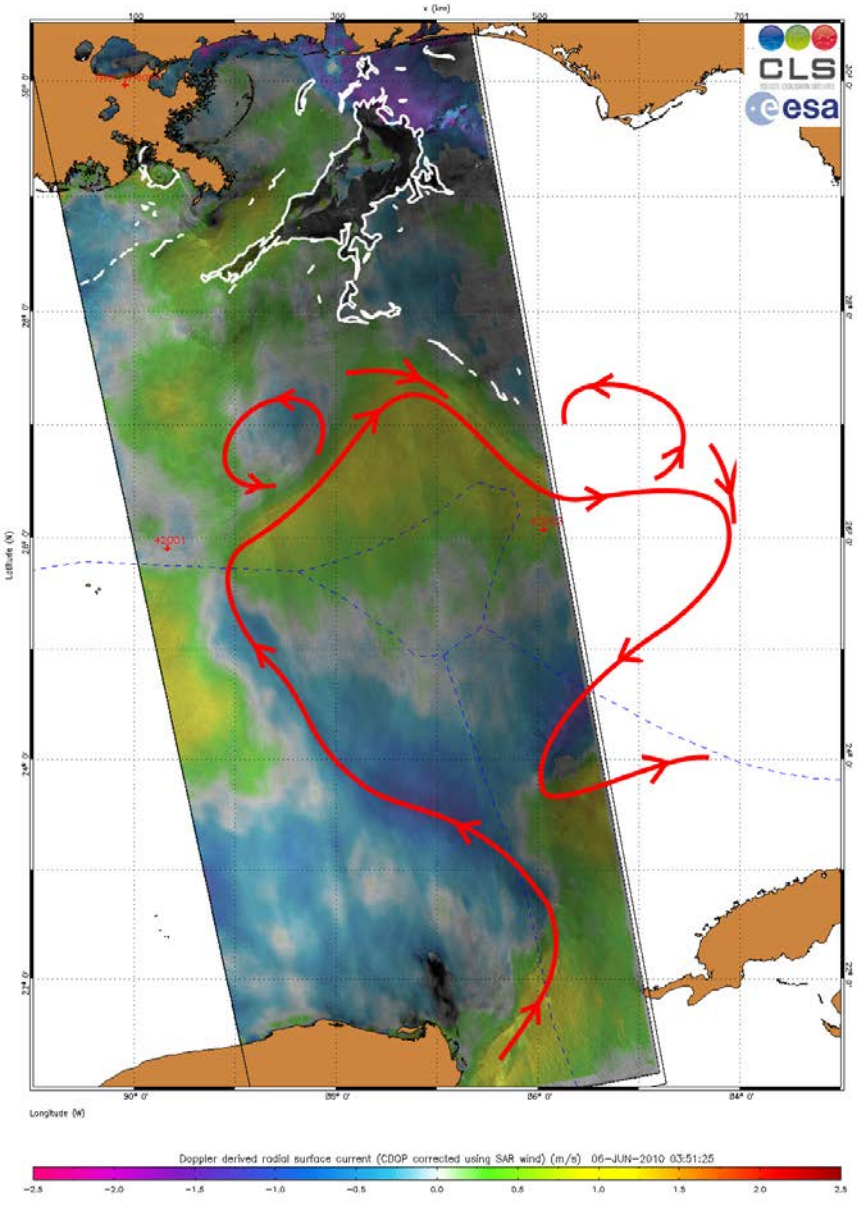
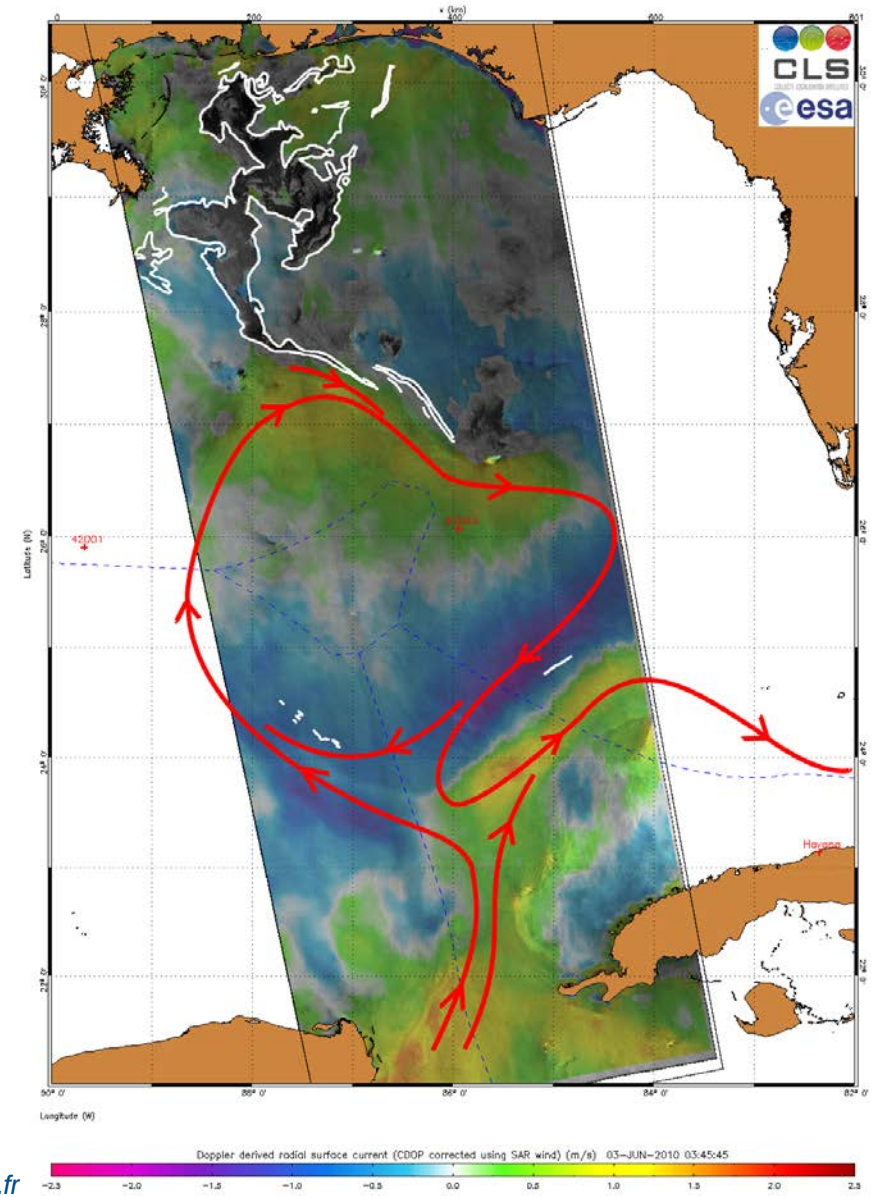
Towards synergetic analysis





Towards synergetic analysis