

Level-3 Coastal SLA from PISTACH products



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Main Objectives

1. Develop a Level-3 processing adapted to the Level-2 PISTACH products
2. Produce Level-3 datasets for P.I. users and demonstration
3. Investigate the added value of PISTACH processing for coastal regions
4. Investigate the added value of PISTACH processing for open ocean regions thanks to higher resolution products

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2 - Production of datasets for PI users and demonstration

Level 3 products available for **4 regions** over July 2008- July 2011

- Florida Strait (track 102)
- Agulhas Current (tracks 20, 198, 96, 172, 248)
- US East Coast (tracks 50, 126)
- US West Coast (tracks 206 - 69 - 28 - 247)

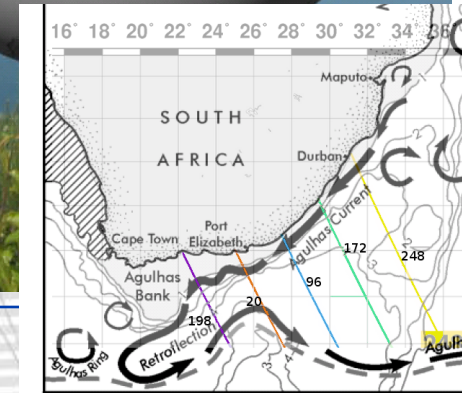
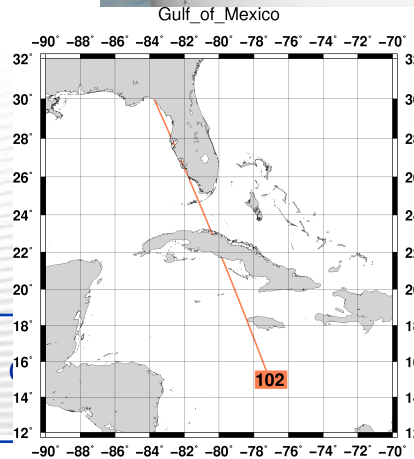
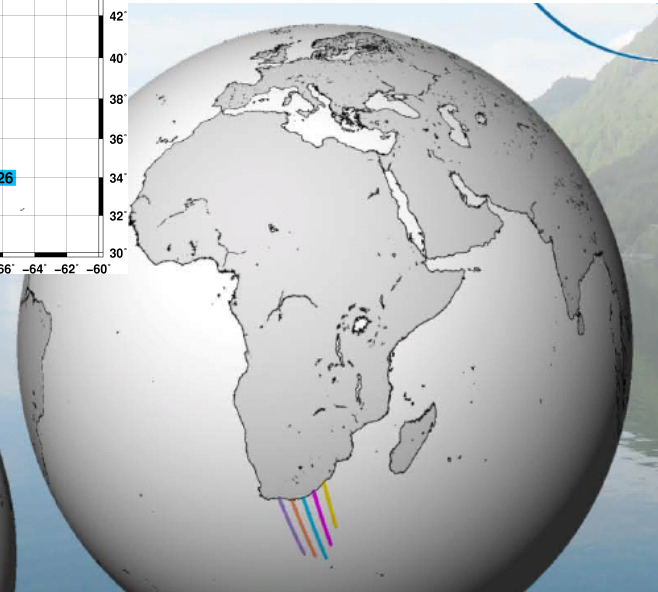
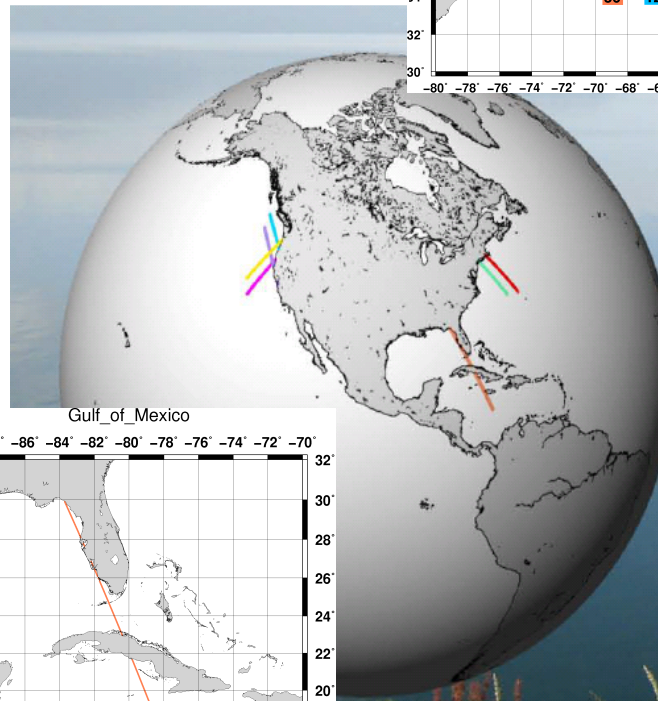
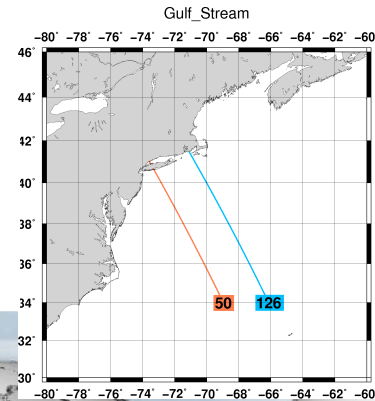
Delivered on the **AVISO website**

→ Products

→ sea-surface-height-products

→ Regional

→ coastal dt-sla-products



2 - Production of datasets for PI users and demonstration

- Article in AVISO Newsletter on 25.07.2012 “Release of new regional products: Coastal DT SLA Jason-2 “
- 2 Data Use Cases showing the results over the Florida strait and Agulhas Current

http://www.altimetry.info/html/use_cases/data_use_case_agulhas1_pistachL3_en.html

http://www.altimetry.info/html/use_cases/data_use_case_flokeys1_pistachL3_en.html



The screenshot displays the 'Radar Altimetry Tutorial' website. The main heading is 'Radar Altimetry Tutorial'. The page is organized into several sections:

- Overview**
- Applications**
 - Geodesy & geophysics
 - Ocean
 - Ice
 - Climate
 - Atmosphere, wind & waves
 - Hydrology & land
 - Coastal
- Data use cases**
- Altimetry**
 - Hourly tracks
 - Data flow
 - Future technology improvements
- Altimetry missions**
 - Past missions
 - Current missions
 - Future missions
- Products**
 - Product list
 - Toolbox
- FAQs**
 - Applications
 - Altimetry
 - Toolbox
- Acknowledgments**

The 'Data use cases' section is expanded to show '2.1.5 The Florida Keys currents by using coastal dedicated products'. This section includes a sub-heading 'Satellite altimetry dedicated to coastal ocean.' and a detailed paragraph explaining the limitations of satellite altimetry near coastlines and the specific data use case for the Florida Keys area. It mentions the 'Coastal along-track Delayed Time Sea Level Anomaly (CoastalDT-SLA)' products and provides instructions on how to use them. A 'Data used' section follows, detailing the Jason-2 CoastalDT-SLA product and the Level-2 products used for reference tracks. It also provides information on how to download the data from the Aviso FTP server.

3 - Added value of PISTACH L3 for coastal regions

How to prove that PISTACH SLA help to better monitor physical signal in coastal areas?

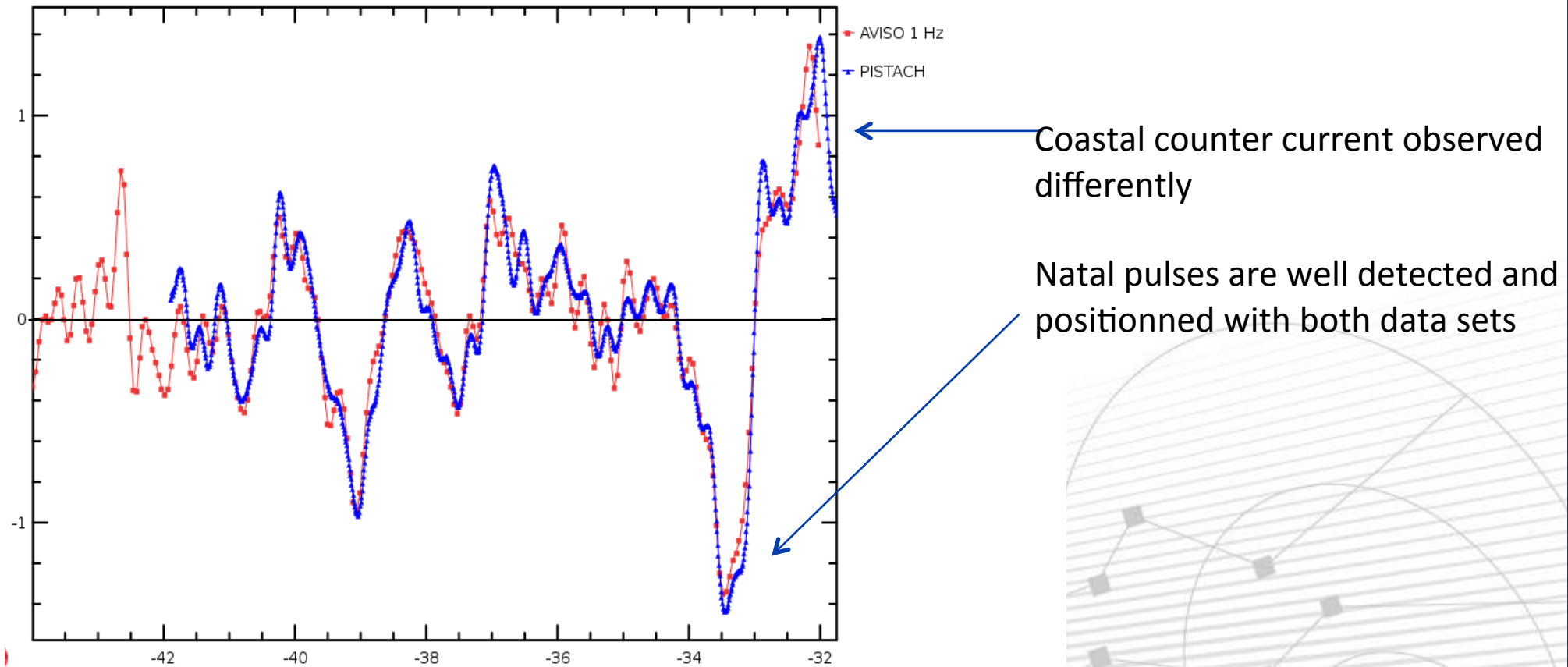
- Looking at the altimetry alone

➤ Focus on anomalies of across-track velocities

3 - Added value of PISTACH L3 for coastal regions

➤ Anomalies of across-track velocities

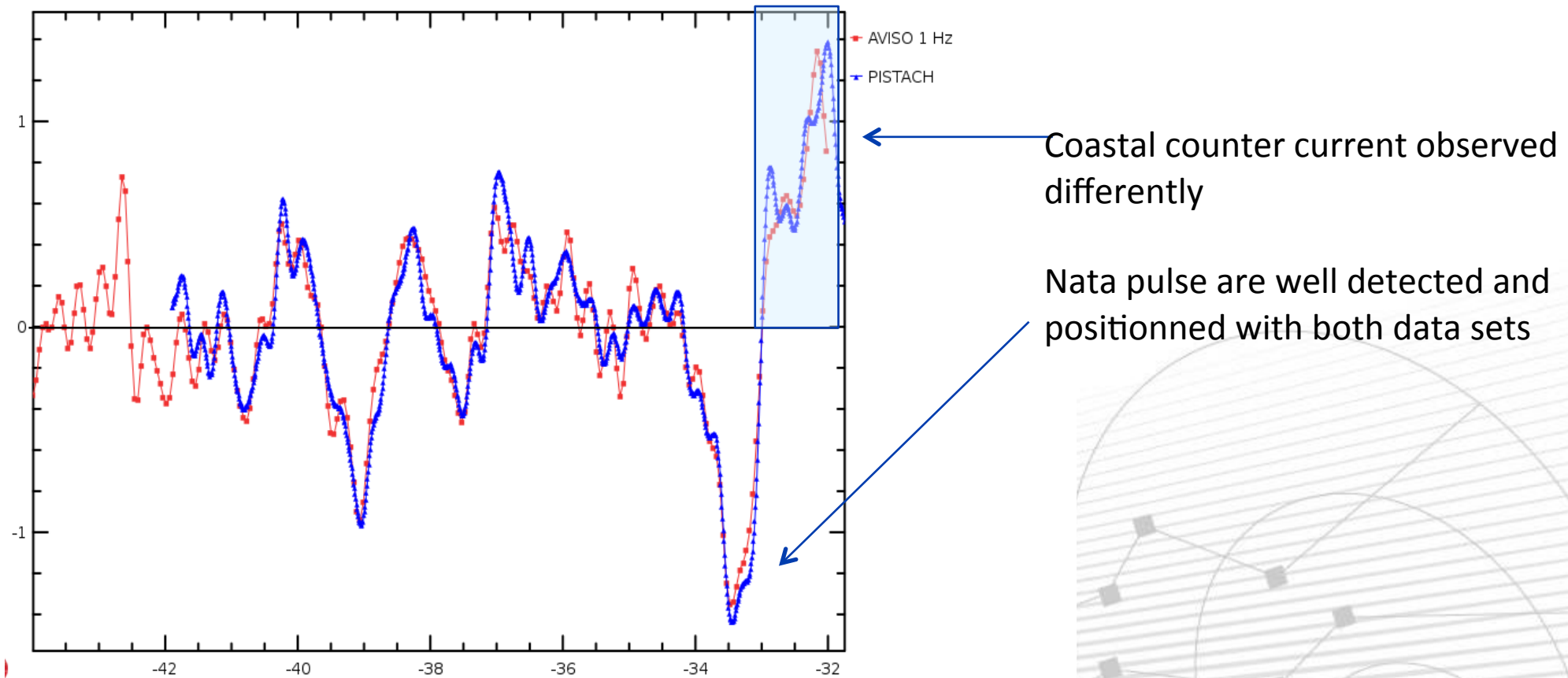
Focus on the Agulhas Current along track 172



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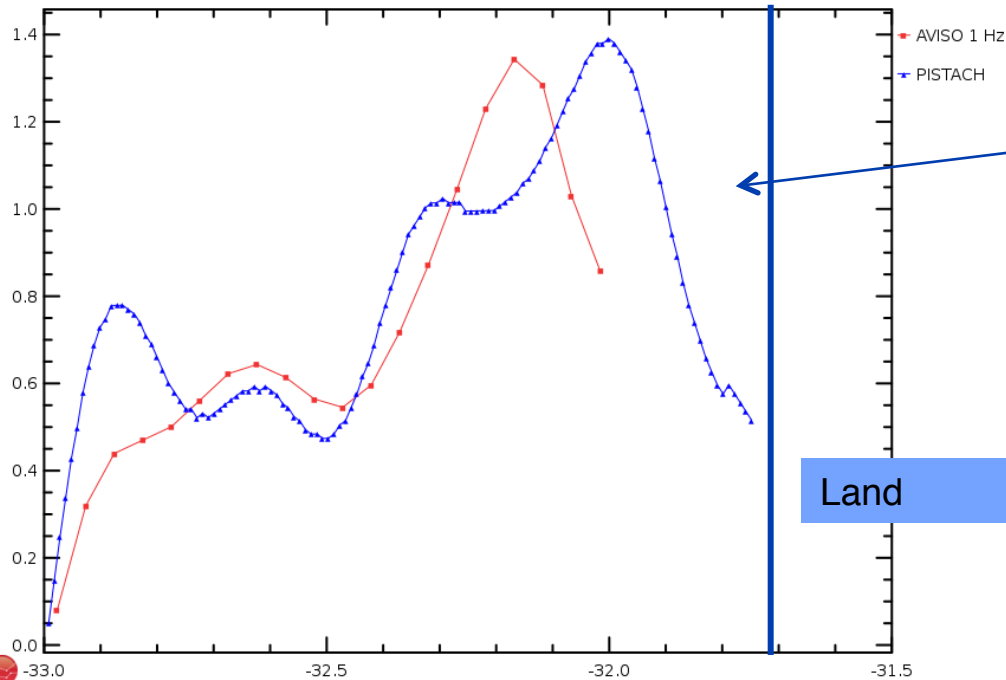
➤ Anomalies of across-track velocities

Focus on the Agulhas Current along track 172



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➤ Anomalies of across-track velocities



**Zoom over the coastal part
along track 172**

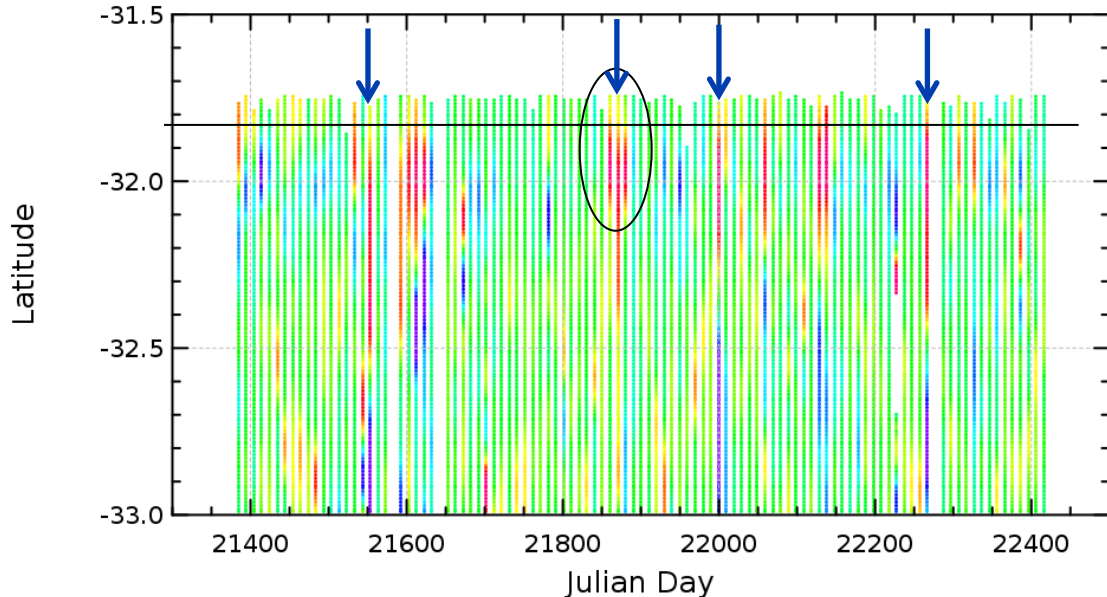
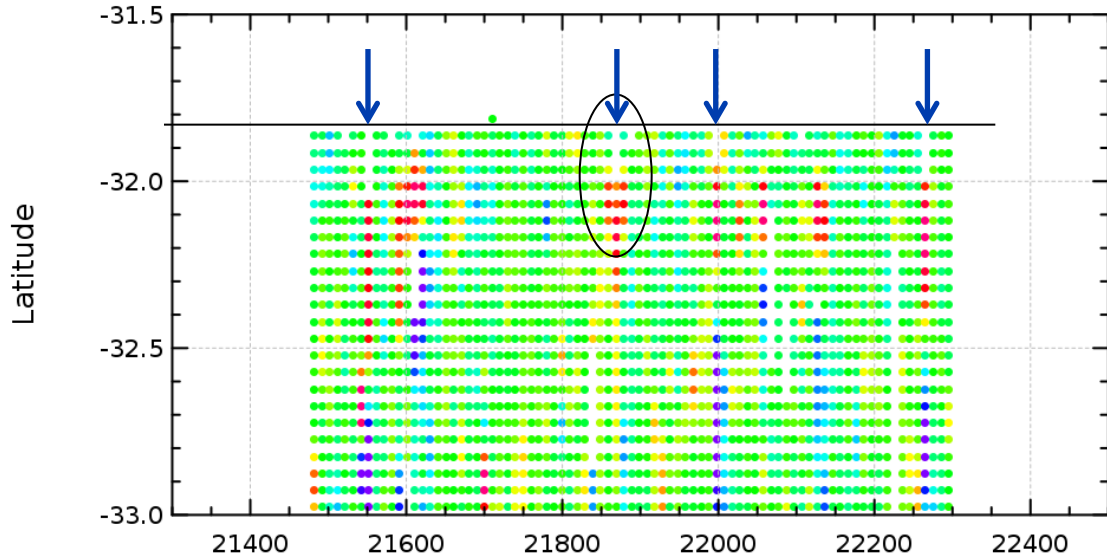
The Coastal counter current is
observed differently in the two
datasets

The maximum of the current is moved by 10 km between **1 HZ GDR** and **PISTACH** data , located closer to the coast with the **PISTACH** data

3 - Added value of PISTACH L3 for coastal regions

➤ Anomalies of across-track velocities

1 Hz velocities



Latitude-Time diagrams of velocities (m/s)
over the coastal part along track 172

Positive anomalies = coastal counter-current

detected by both datasets

But

The inshore edge of the current is better tracked with PISTACH dataset



PISTACH velocities

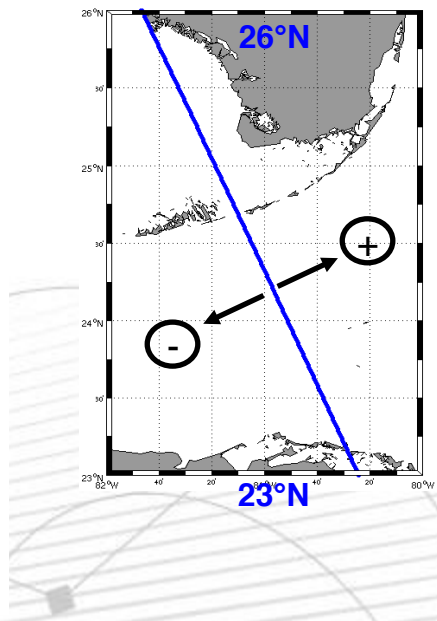
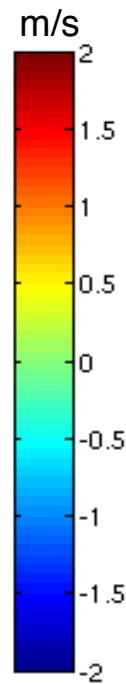
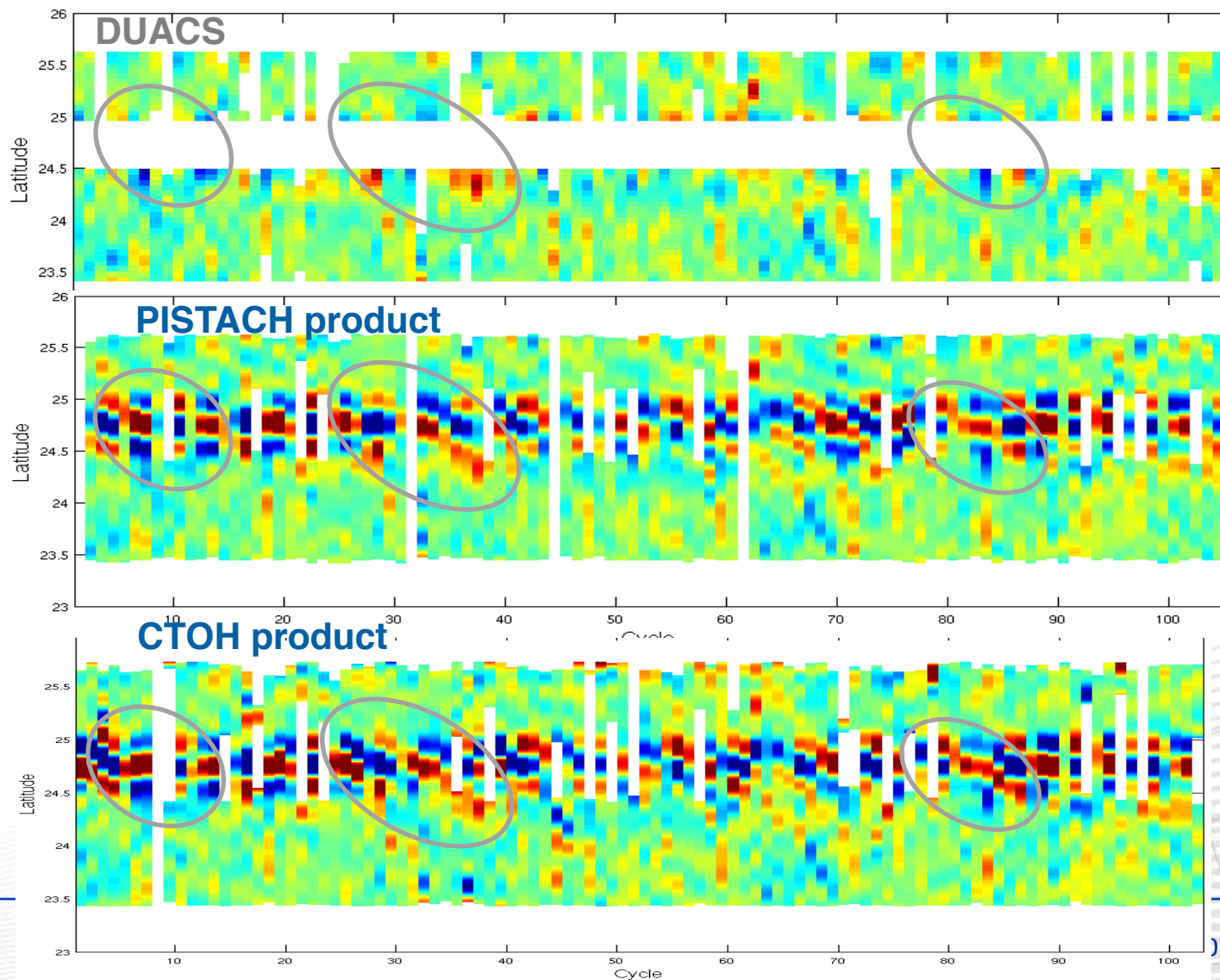
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- The altimetry alone
 - PISTACH cross-track velocities anomalies are coherent both in time and space
 - Observed structures are close to the standard 1 Hz data sets but located differently => more confident in the PISTACH data because they provide more points to compute more accurately the velocities
- Comparison with external data sets
 - **Comparison with other coastal altimetry products from CTOH**

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➤ Coastal altimetry inter-comparison



Good agreement between cross-track velocities computed with the 2 datasets

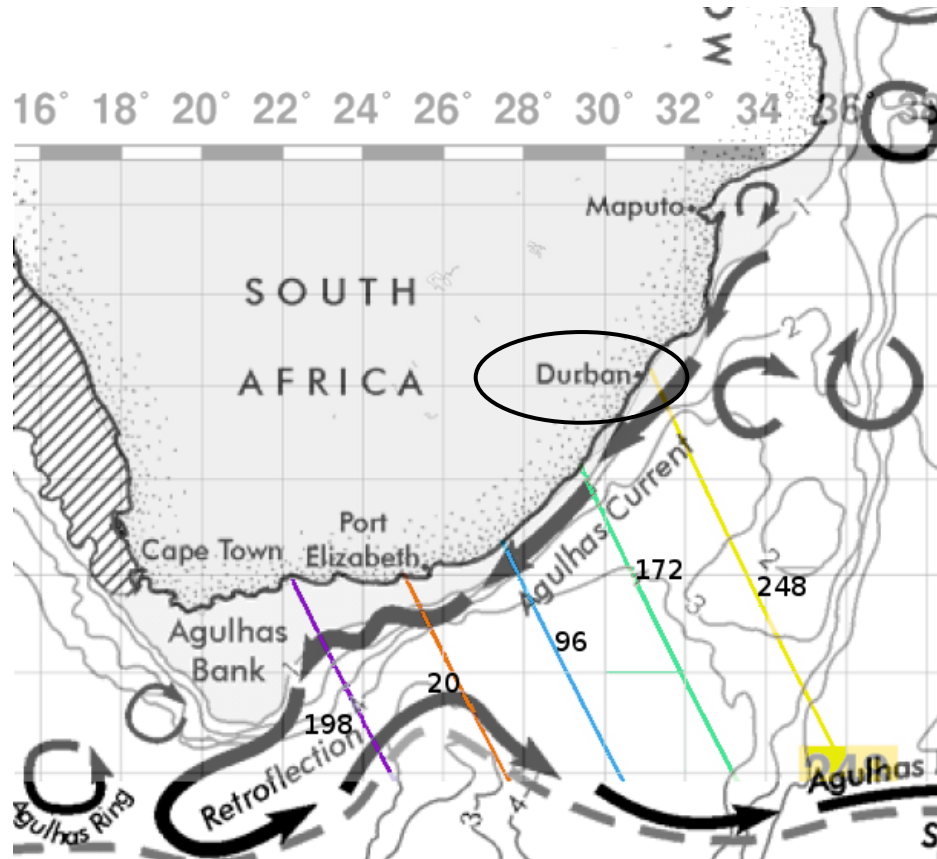
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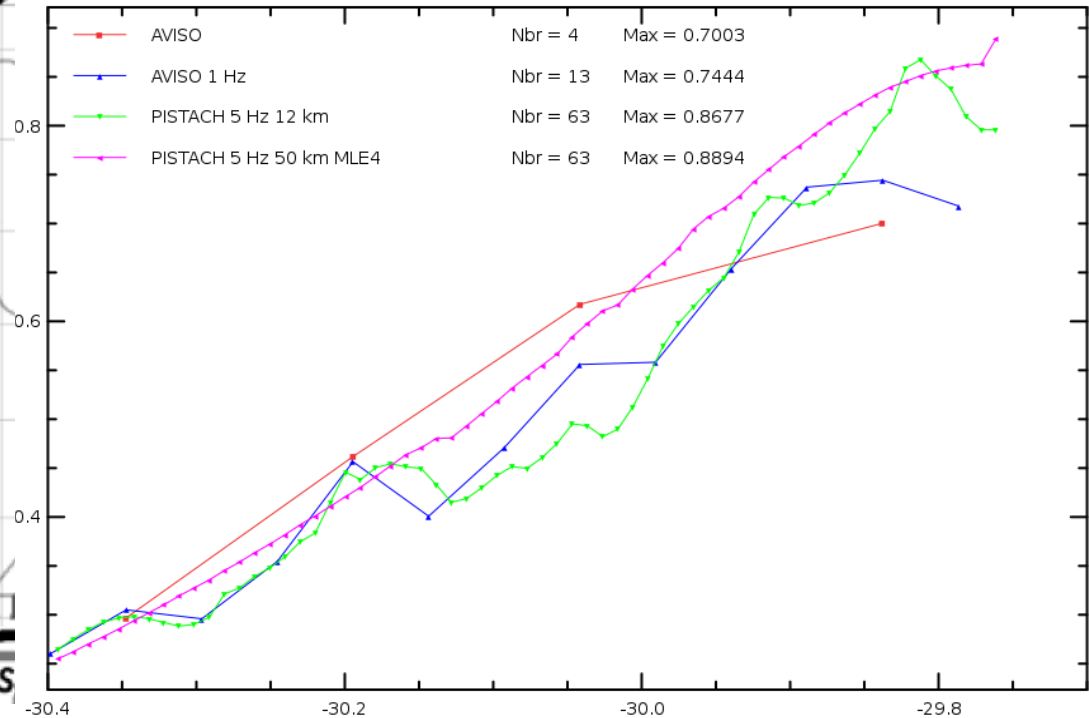
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 - **Comparison with coastal Tide Gauges**

3 - Added value of PISTACH L3 for coastal regions

➤ Comparison with Tide Gauges



Durban TG
Agulhas Current track 248



Thanks to PISTACH L3 SLA

- the location of the maximum of correlation between altimetry and tide gauge is better determined.
- the correlation is improved by 10 % in some cases

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 - **Comparison with coastal ADCP in Florida Strait (Cancet et al., 5th coastal meeting)**
 - Comparison with ADCP in Agulhas Current (See M.Cancet's talk)

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4 - Added value of PISTACH L3 for open ocean (HR)

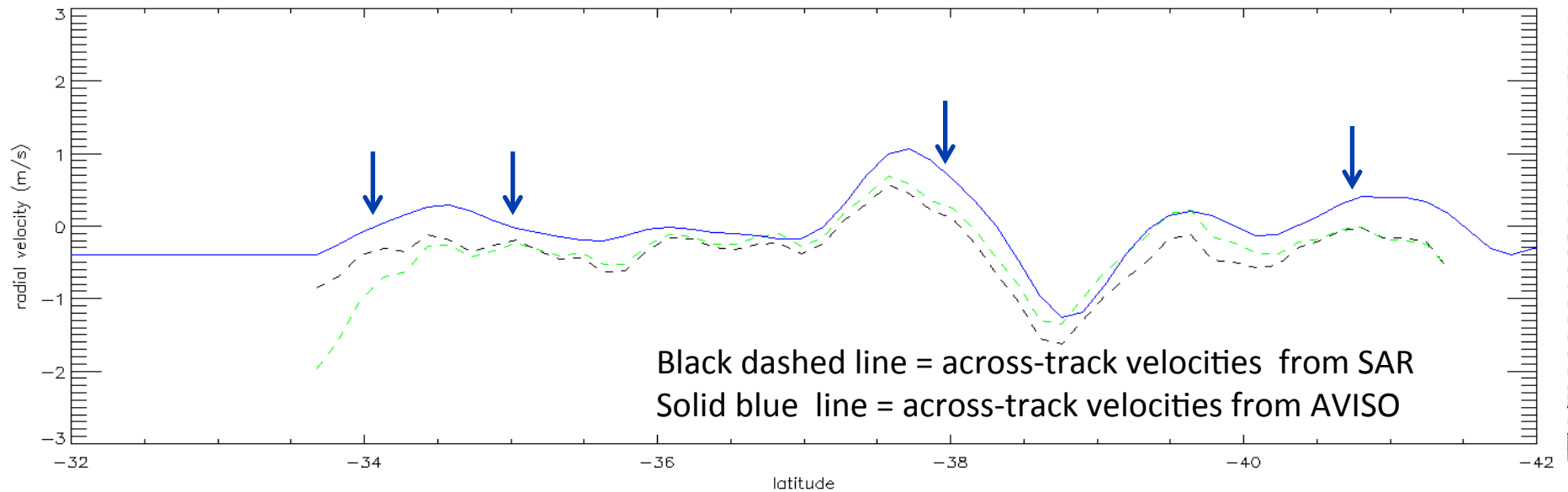
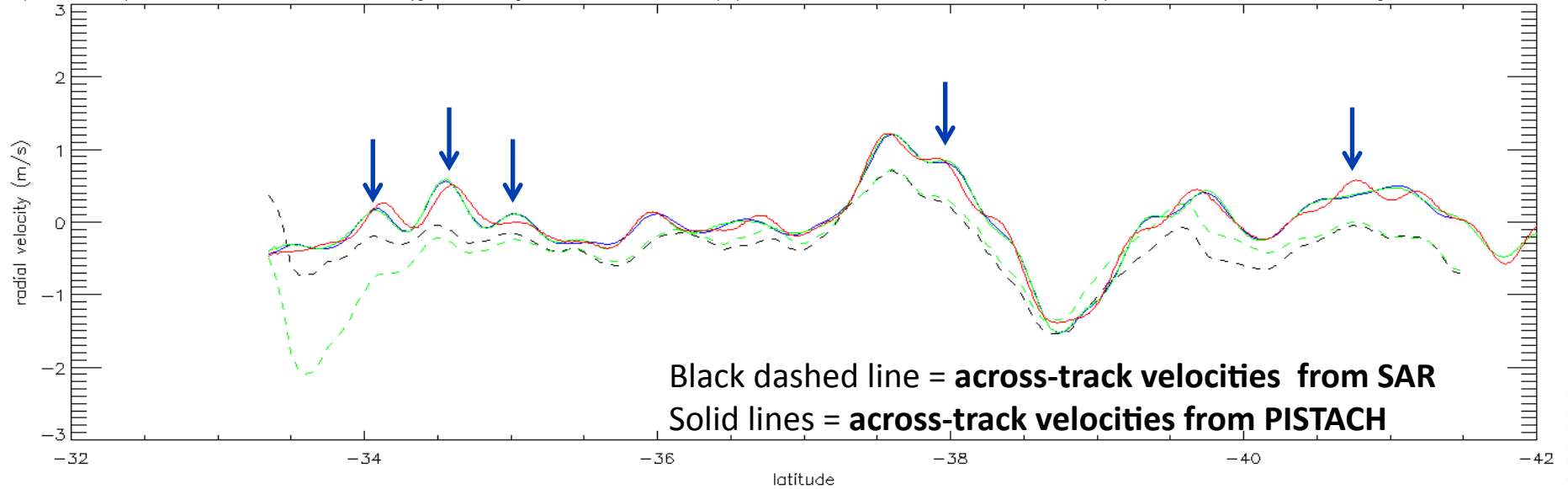
This ambitious objective was followed to investigate which spatial scales of the geophysical signal can really be dragged out altimetry, both in SLA and in SLA slope (velocity).

It appears first that **PISTACH velocities** obtained from 50km filtered-SLA can recover small scale structures that are not observed with the AVISO products (1hz filtered and sub-sampled)

Such small structures are also confirmed by the collocated SAR measurements.

4 - Added value of PISTACH L3 for open ocean (HR)

Cycle 60 / SAR rad. vel. : dashed (green orig., black MDT rem.) / PISTACH radial vel. : solid line (MLE4 V2 blue, RED3 V2 green, OCE3 v2 re



4 - Added value of PISTACH L3 for open ocean (HR)

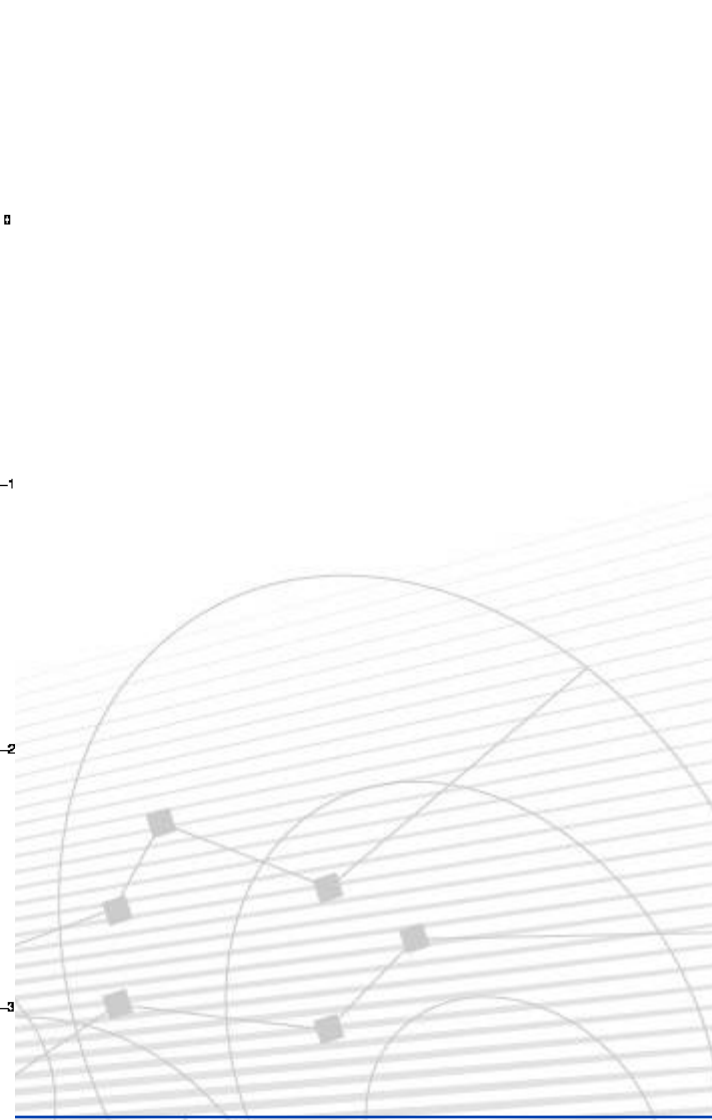
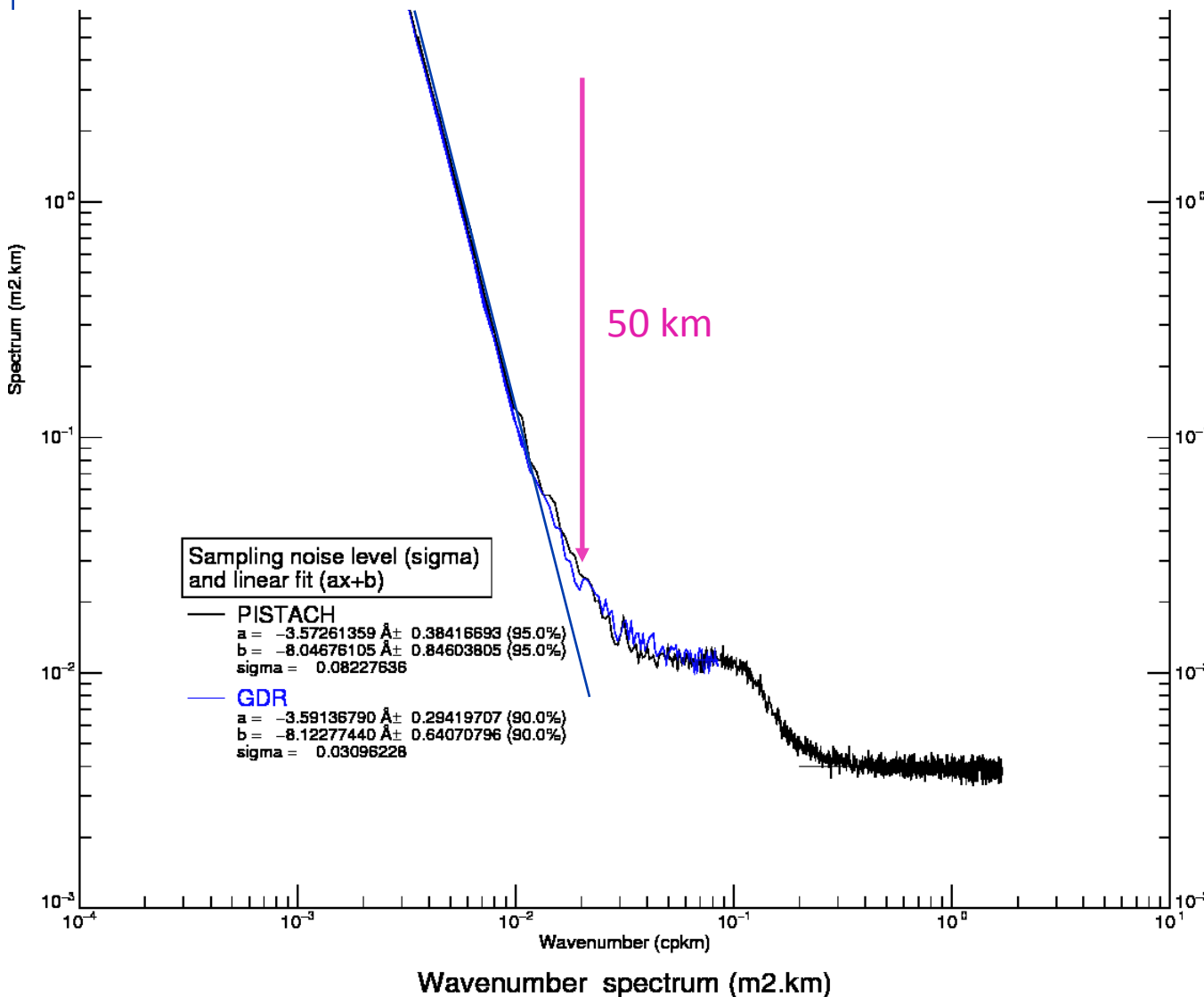
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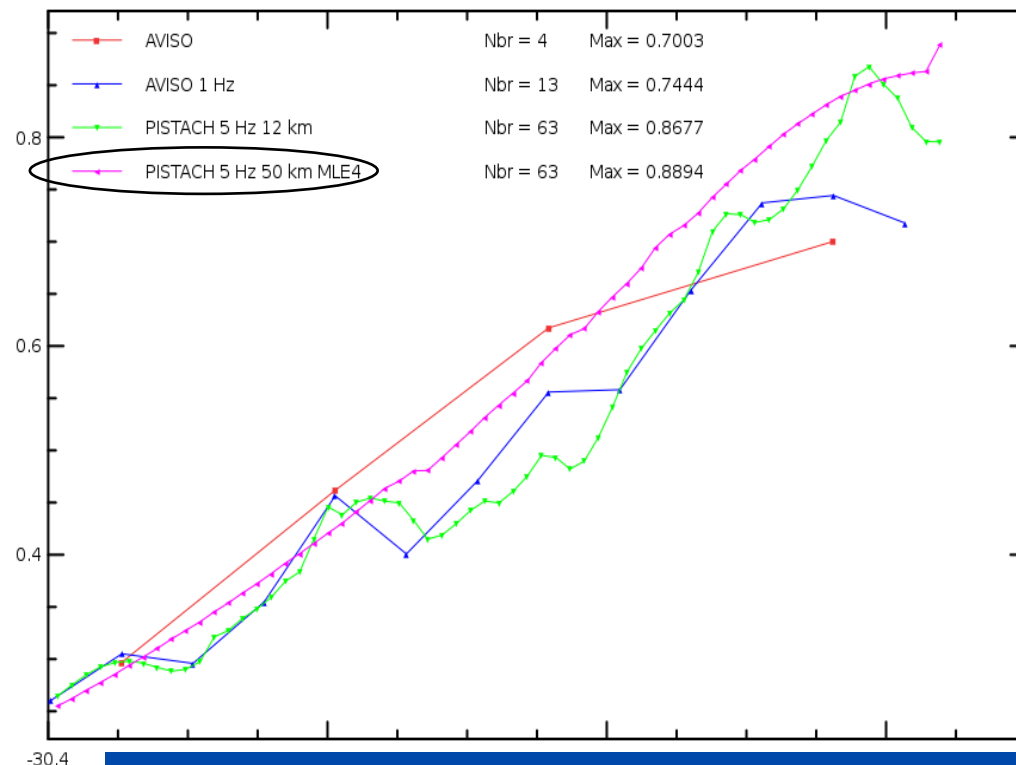
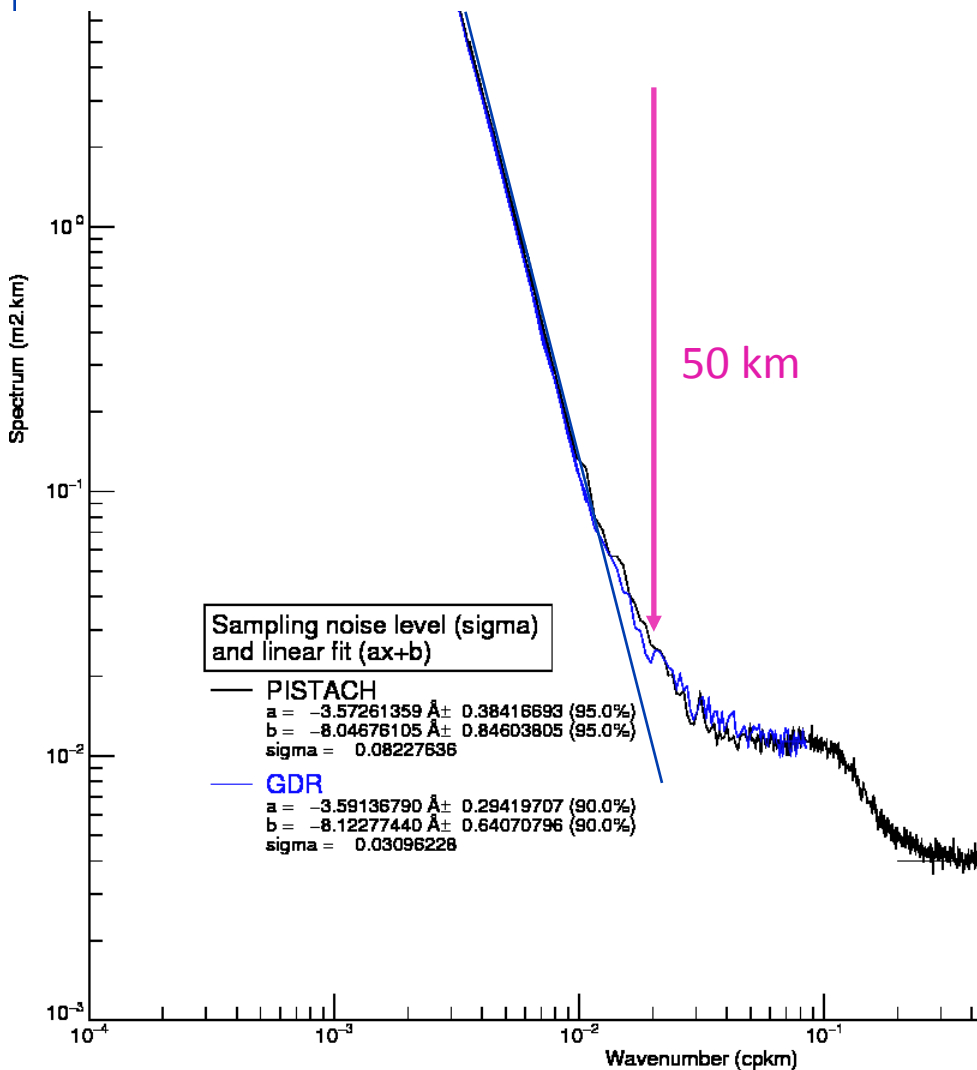
In term of Sea Level, PISTACH L3 profiles exhibit small scales structures below 50km which contain both geophysical signal and correlated errors. This is evidenced by spectral analysis which shows a signal to noise ratio too low for extracting accurate signal.

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Durban Tide Gauge



When PISTACH SLA are filtered with a 50km cut-off length, the time correlation to Tide Gauges is increased (pink vs green)

Wavenumber spectrum (m2.km)

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→ **Comparison with other HR datasets of Sea Level** would validate the small scales content. Thus a multi-mission HR processing would serve this investigation.

Conclusion/Prospection

L3 altimetry products have been conceived from L2 PISTACH products and their **contribution for observing the coastal ocean** has been evidenced.

These L3 products have been provided over several selected areas. They are available onto the AVISO website together with **Data Use Cases** with BRAT.

To **go further** in this production of **PISTACH products**, the PISTACH prototype would be soon updated and apply on new satellite missions (see E.Bronner's talk).

Establishing a **strong link between coastal altimetry and the coastal models community** is also crucial. Collaborations with members of the GODAE COSS-TT group (see V. Kourafalou's talk) should start in the coming months.

This work has also risen a strong **questioning of altimetry errors** at small scales and these high resolution PISTACH data sets constitute an **interesting mean of validation for SAR mode missions** (Cryosat-2, Sentinel-3) and SWOT.

Thank
you