Assessing SARAL/AltiKa near-real time data in the coastal zone: comparisons with HF radar

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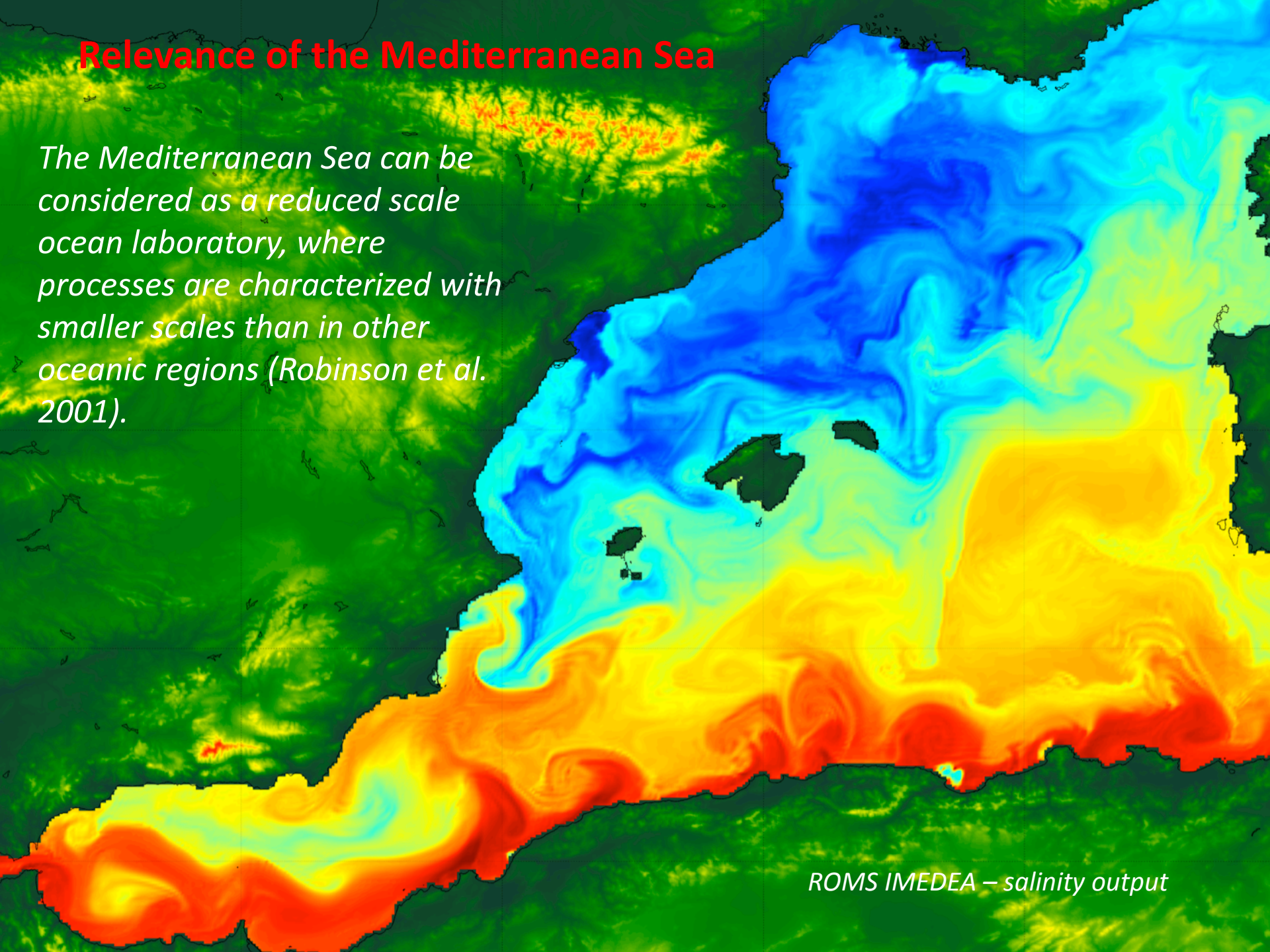
Relevance of the Mediterranean Sea

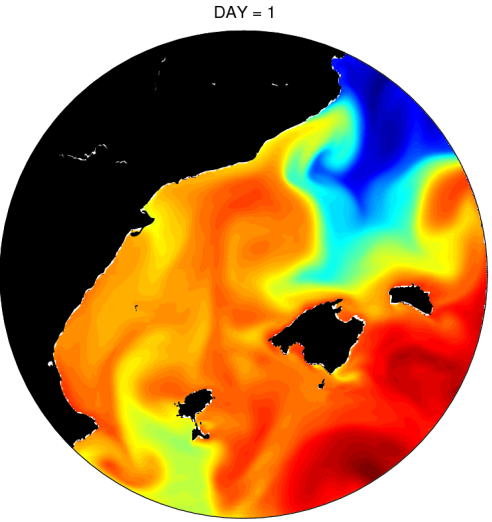
The Mediterranean Sea can be considered as a reduced scale ocean laboratory, where processes are characterized with smaller scales than in other oceanic regions (Robinson et al. 2001).

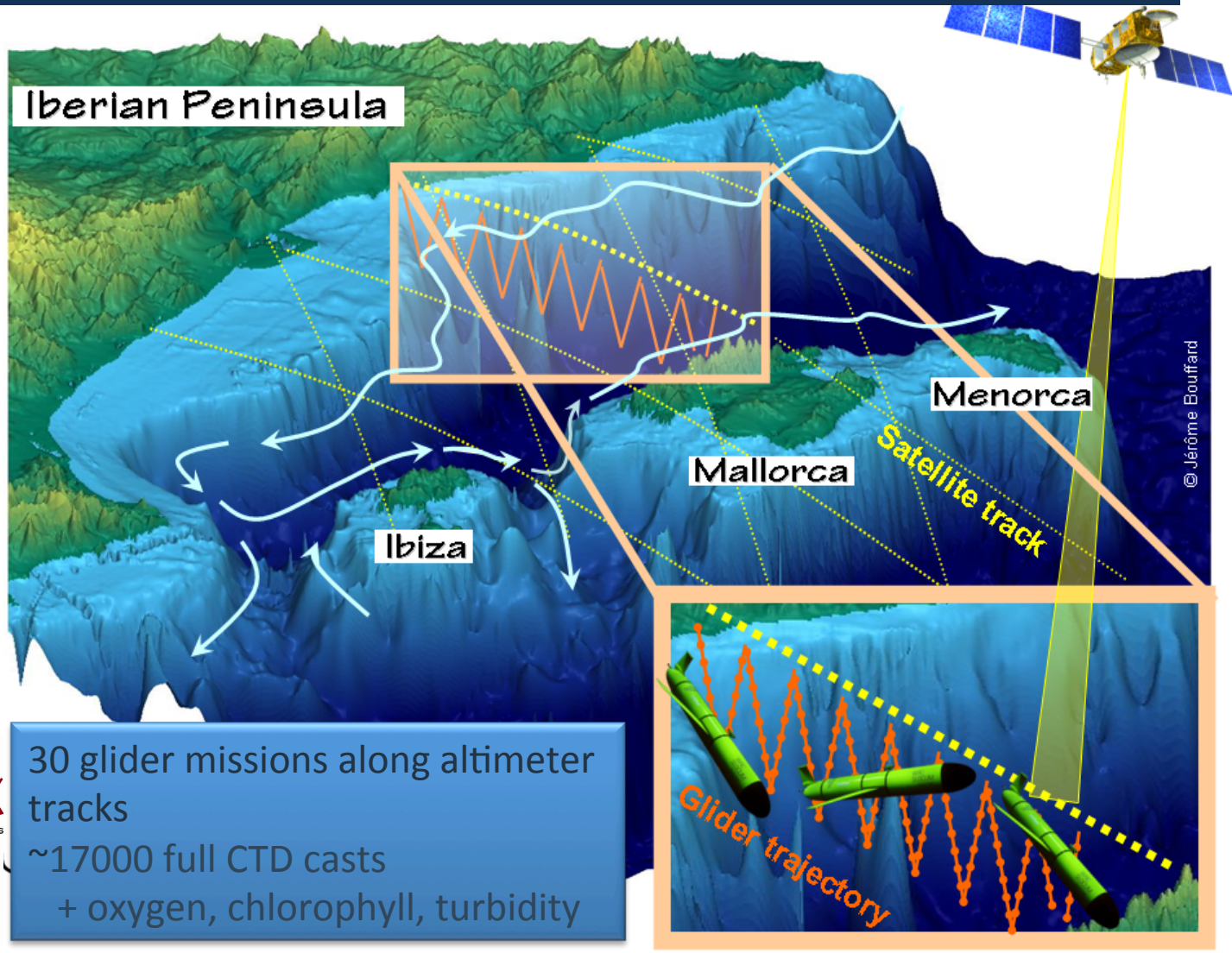


ROMS IMEDEA – salinity output

Multi-platform experiments: synergy altimetry and other sensors

Ruiz et al. 2009
Pascual et al. 2010
Bouffard et al. 2010
Bouffard et al. 2012
Pascual et al. 2013
Troupin et al. 2014





30 glider missions along altimeter tracks
~17000 full CTD casts
+ oxygen, chlorophyll, turbidity

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ADVANCES IN SPACE RESEARCH
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Illustration of the emerging capabilities of SARAL/AltiKa in the coastal zone using a multi-platform approach

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Illustration of the emerging capabilities of SARAL/AltiKa in the coastal zone using a multi-platform approach

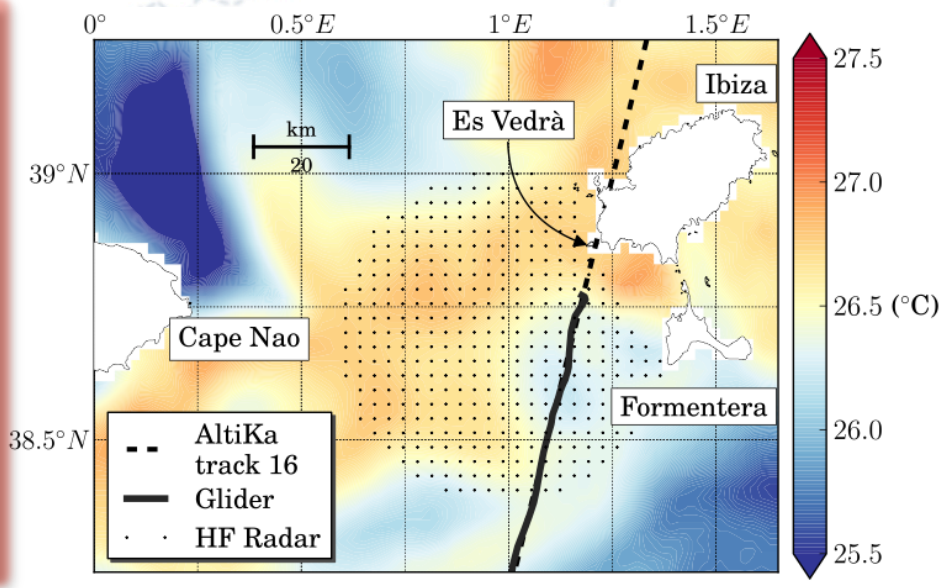
G-AltiKa experiment

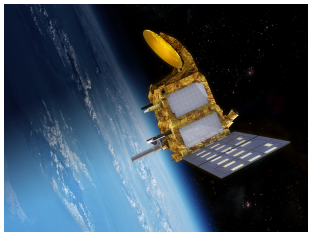
Location: Ibiza Channel (WMED)

Dates: 1-5 August 2013

Platforms:

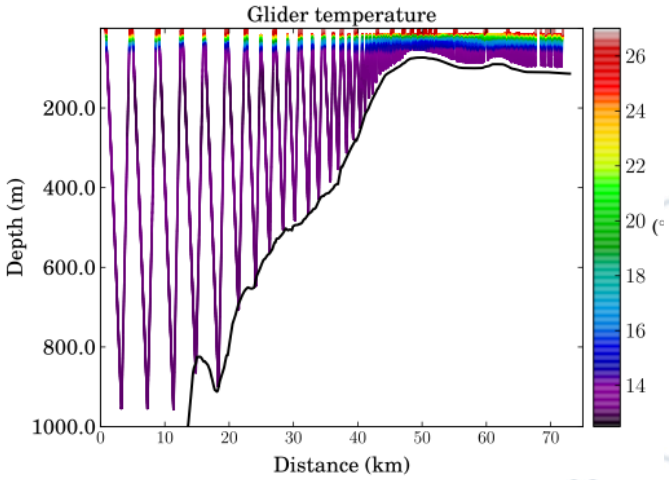
- Glider along SARAL-AltiKa track
- HF-radar
- 2 surface drifters
- SARAL/AltiKa:
  - 1 Hz (AVISO NRT)
  - 40 Hz (PEACHI)

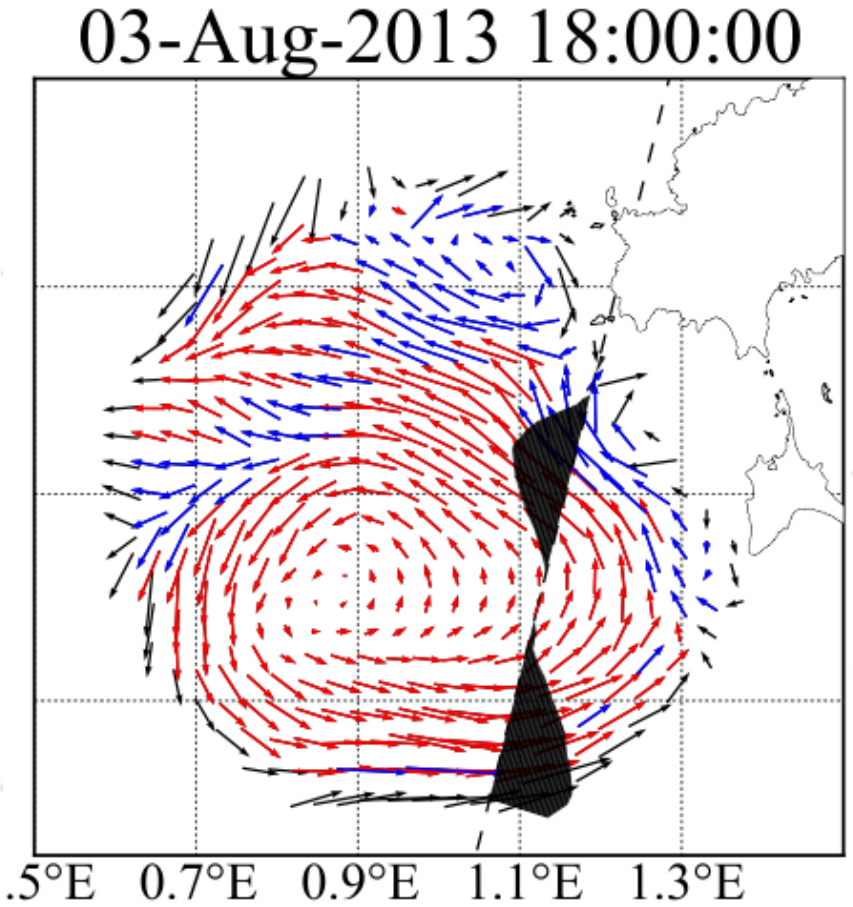




Troupin et al. ASR, 2014

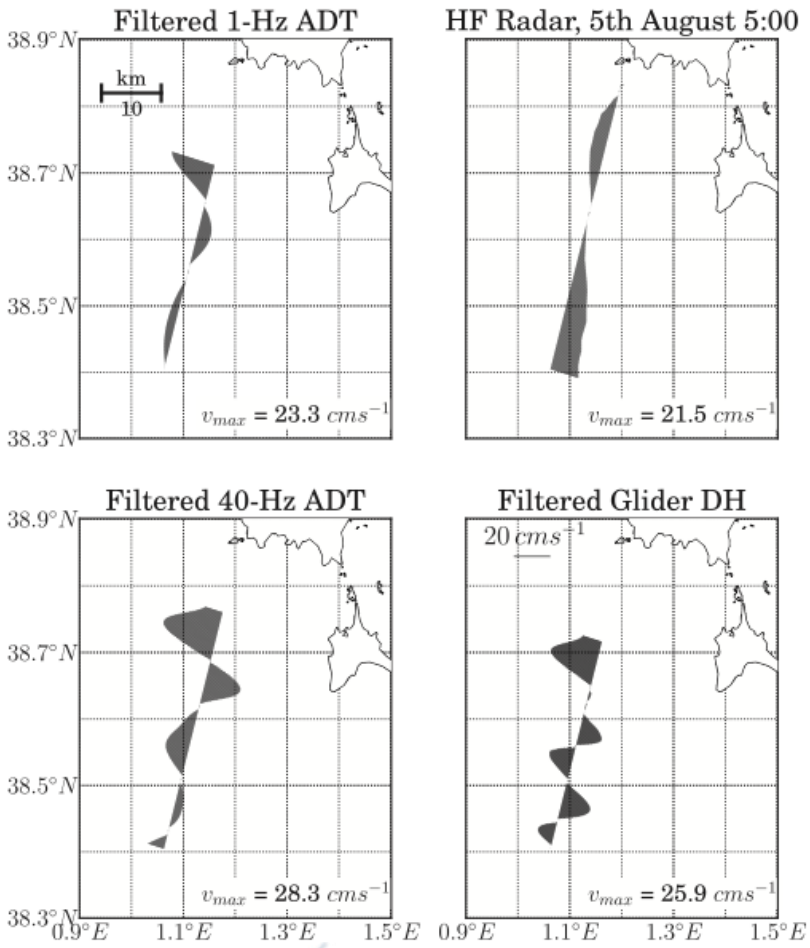
Glider and HF radar





Troupin et al. ASR, 2014

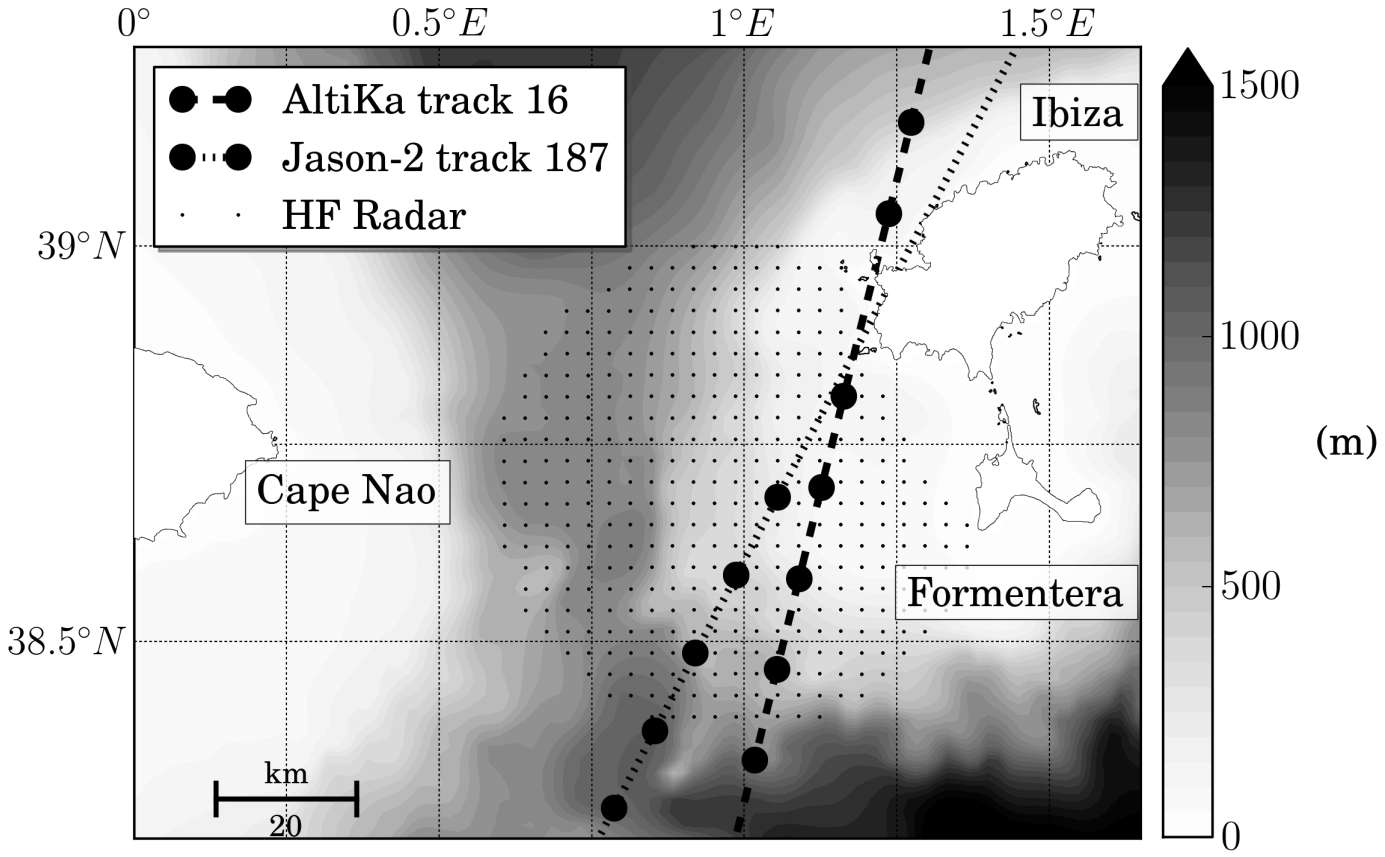
Velocities intercomparison



- After filtering, the 1 Hz and 40 Hz data reveal a NW current consistent with other platforms.
- PEACHI prototype retrieves 40 Hz data closer to the coast.
- HF radar fields do not contain small features (smoothing effects).
- Only one mission. Not statistically significant.

Troupin et al. ASR, 2014

HF RADAR & ALTI NRT (AVISO)



Pascual et al. Mar. Geod. under review

Data Set and Processing

SARAL/AltiKa

- Along track Sea Level Anomaly and Mean Dynamic Topography (SMDT-MED-2014, Rio et al. 2014) ➔ ADT = SLA + MDT
- Horizontal resolution: 14 km (vfec)
- NRT & DT
- Geostrophic velocities obtained by finite differences

HF Radar

- Hourly surface currents with 3 km spatial resolution and a range up to 60 km. 72-h averages.

Period: June 2013-June 2014 (11 cycles)

Pascual et al. Mar. Geod. under review

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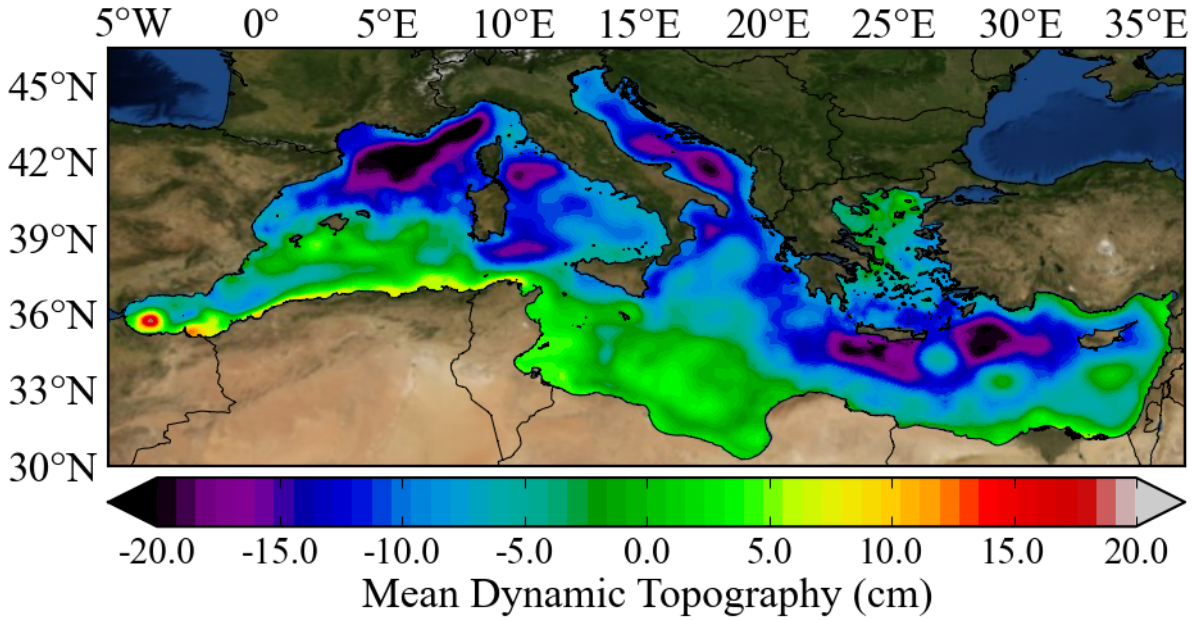
www.ocean-sci.net/10/731/2014/
doi:10.5194/os-10-731-2014

Ocean Science
Open Access

Computation of a new mean dynamic topography for the Mediterranean Sea from model outputs, altimeter measurements and oceanographic in situ data

M.-H. Rio[1], A. Pascual[2], P.-M. Poulain[3], M. Menna[3], B. Barceló[2], and J. Tintoré[2,4]

NEW MDT FOR THE MED SEA



- **Updated datasets and refined processing**
- **PLEASE USE IT!!**

Rio et al. Ocean Science, 2014

Data Set and Processing

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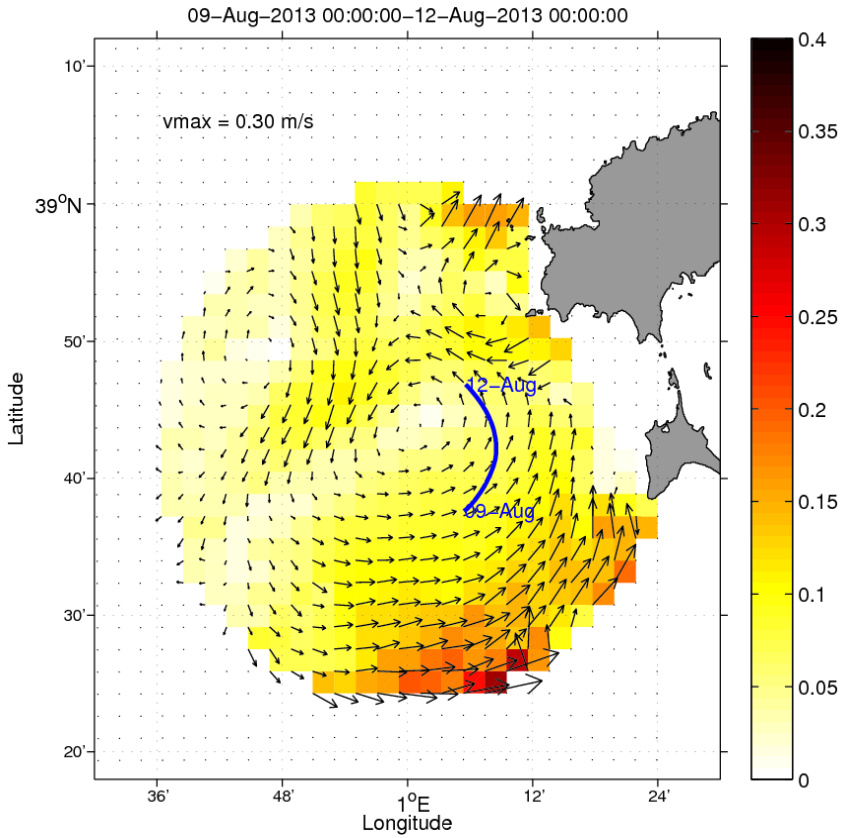
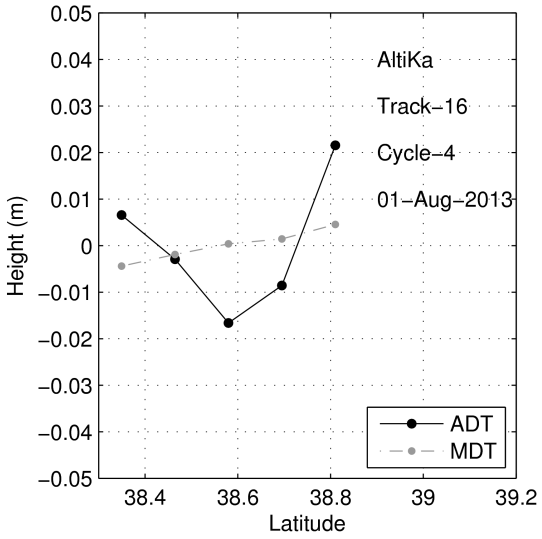
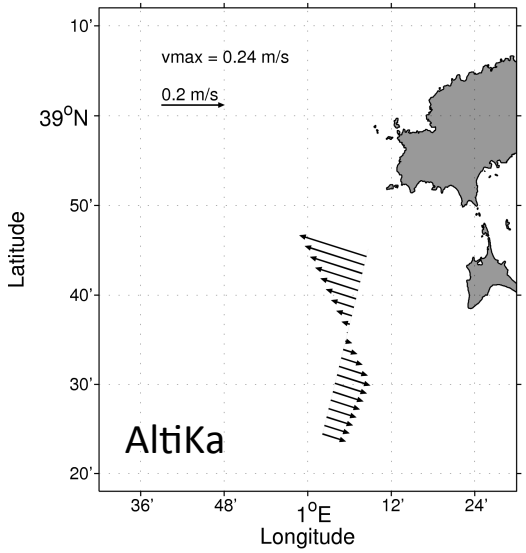
Pascual et al. Mar. Geod. under review

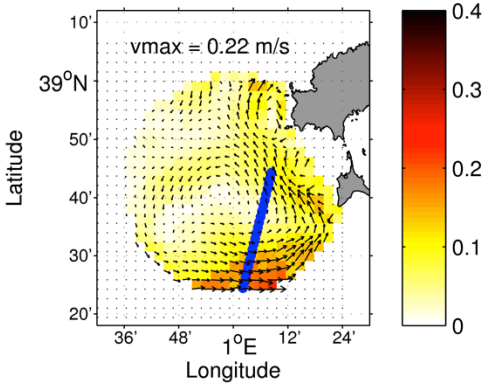
HF radar validation with surface drifters

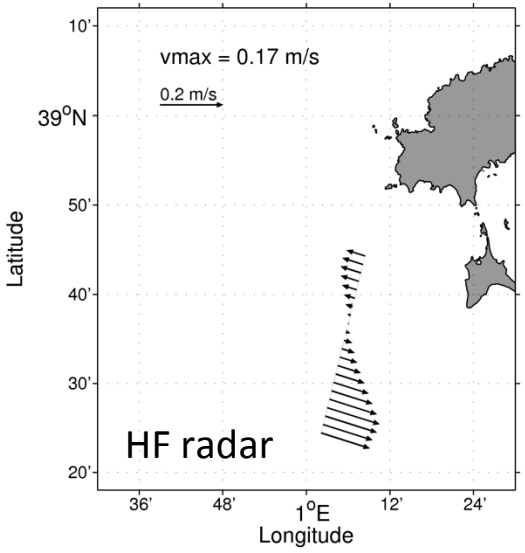


Correlations: 0.8 for the antenna in Ibiza Island, and 0.7 for the antenna in Formentera Island; rms differences of 8.7 cm/s and 10.2 cm/s respectively.



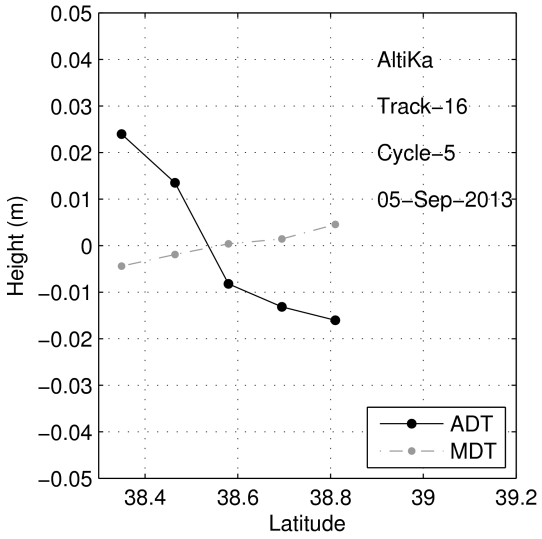


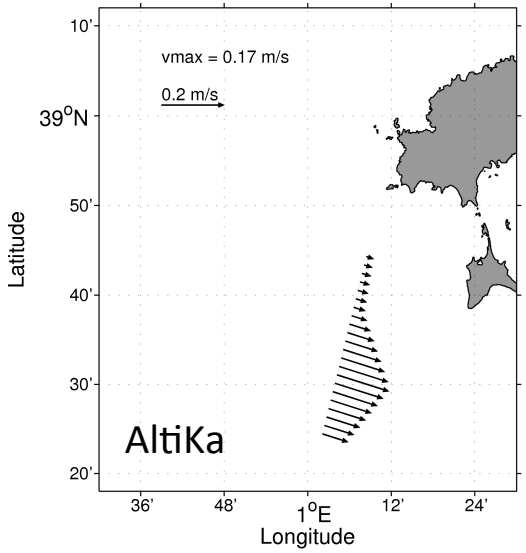




AltiKa vs HF radar

- SARAL/AltiKa derived velocities reveal coherent mesoscale features with general good agreement with HF radar fields
- CYCLONIC EDDY





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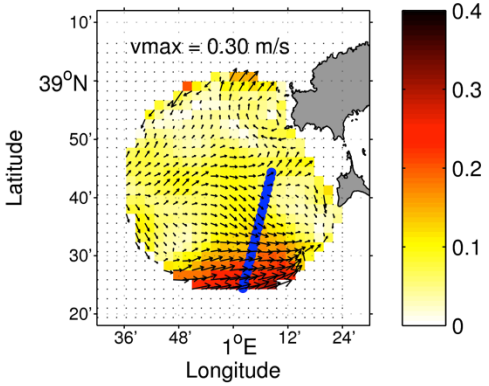
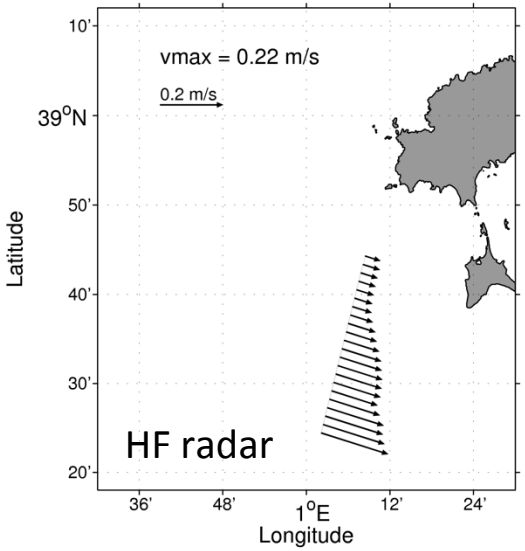
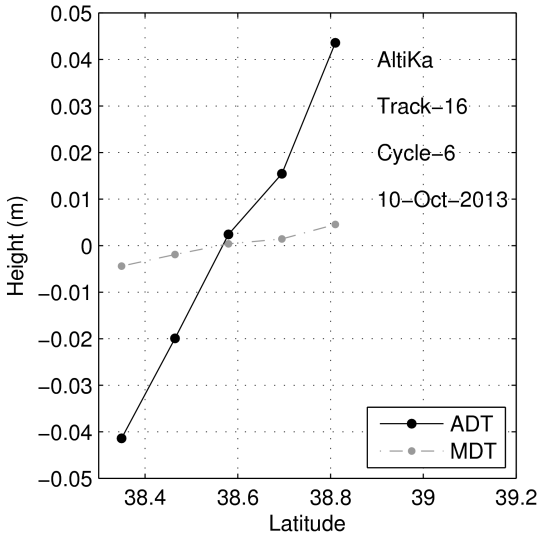
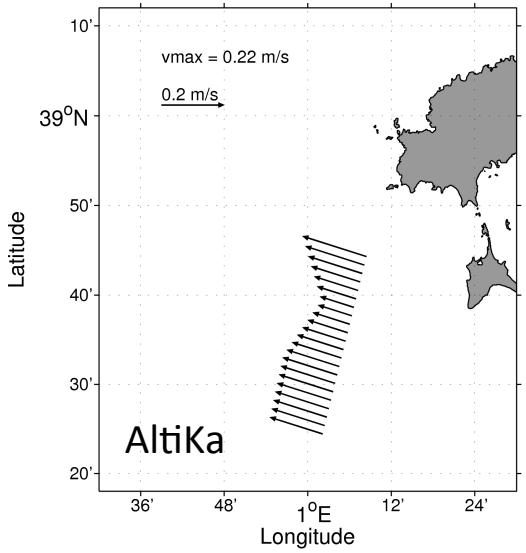
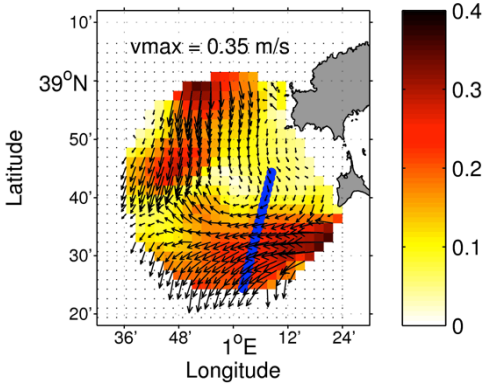
- SARAL/AltiKa derived velocities reveal coherent mesoscale features with general good agreement with HF radar fields
- SE FLOW

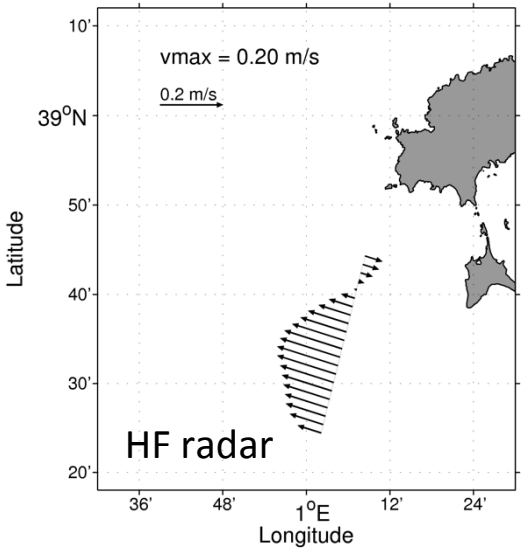






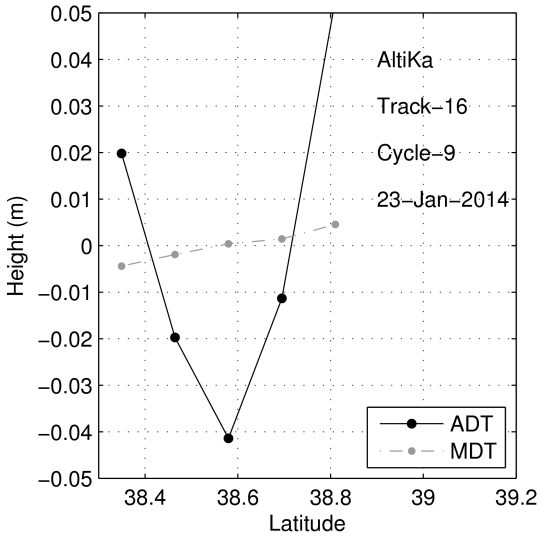


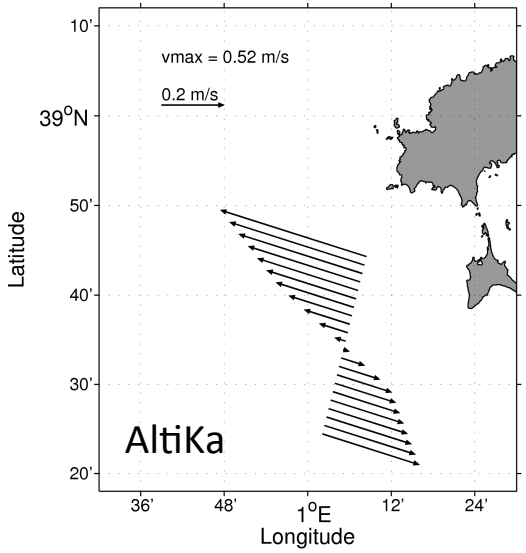


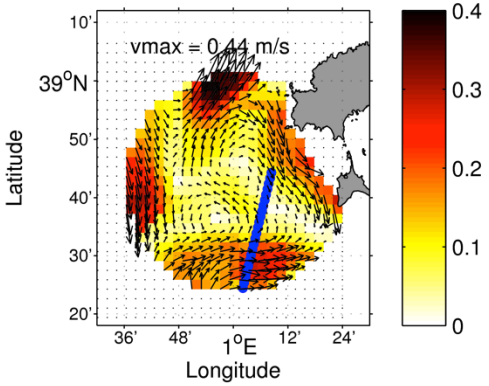


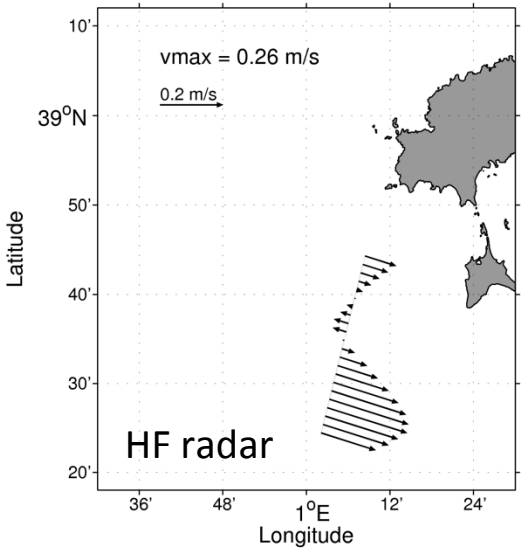
AltiKa vs HF radar

- SARAL/AltiKa derived velocities reveal coherent mesoscale features with general good agreement with HF radar fields
- NW FLOW



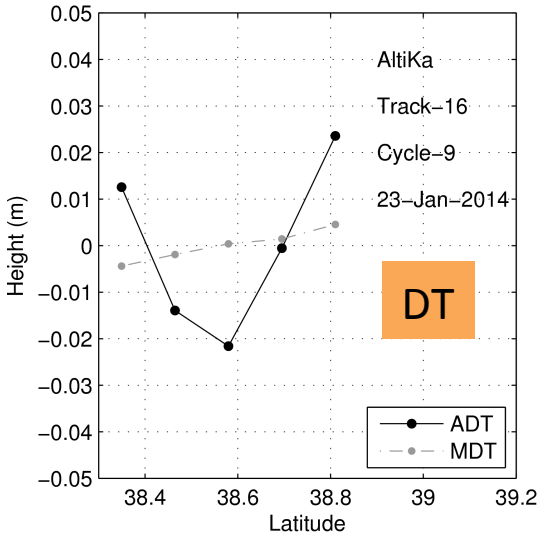


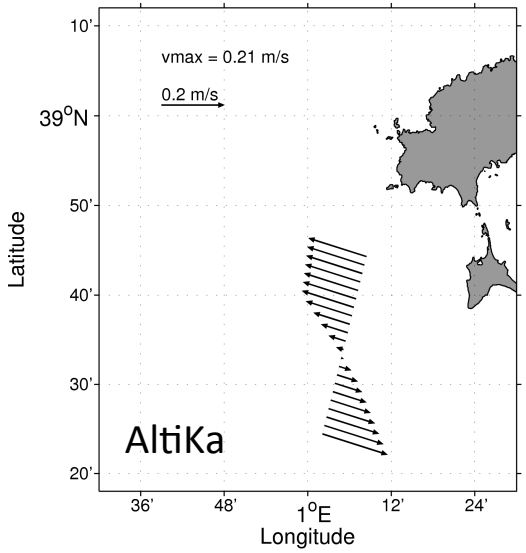


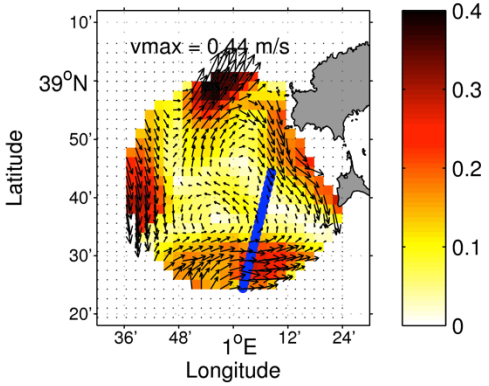


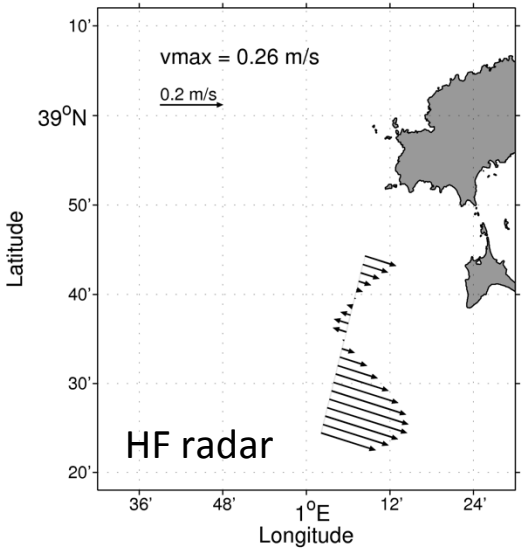
AltiKa vs HF radar

- Lack of agreement close to the coast. Flow reversal. Possible inaccurate editing. Reversal of the flow in the coastal domain.
- SARAL/AltiKa overestimates currents



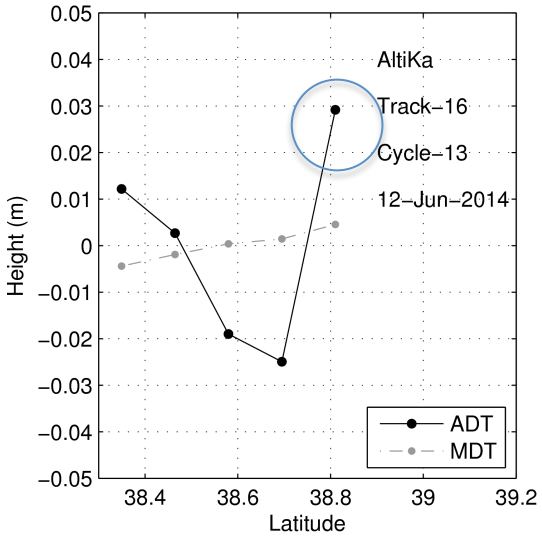


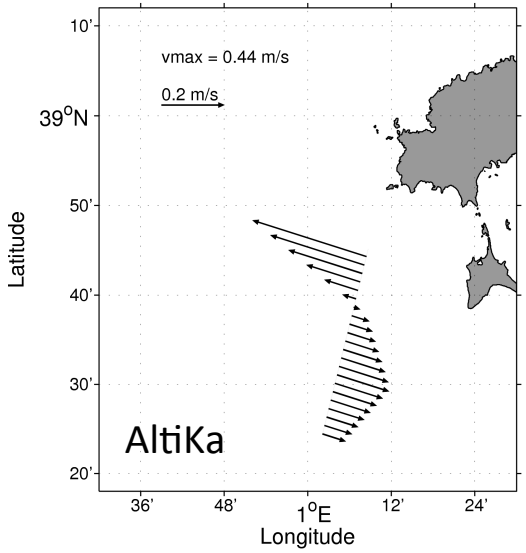


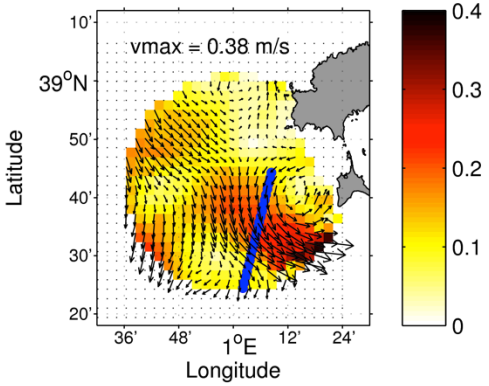


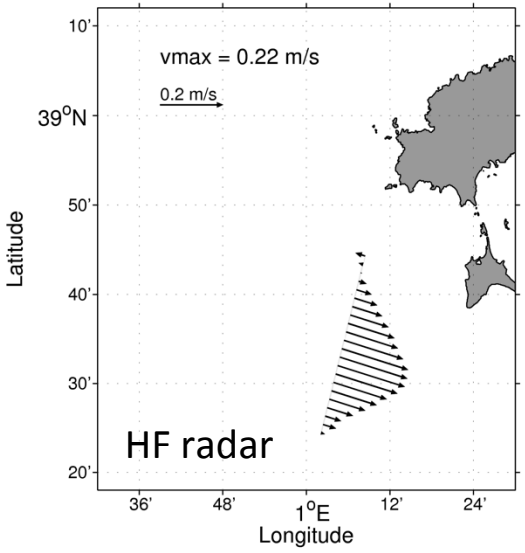
AltiKa vs HF radar

- Delayed Time along track data) slightly improves the agreement for this particular cycle.
- Significant changes between NRT and DT









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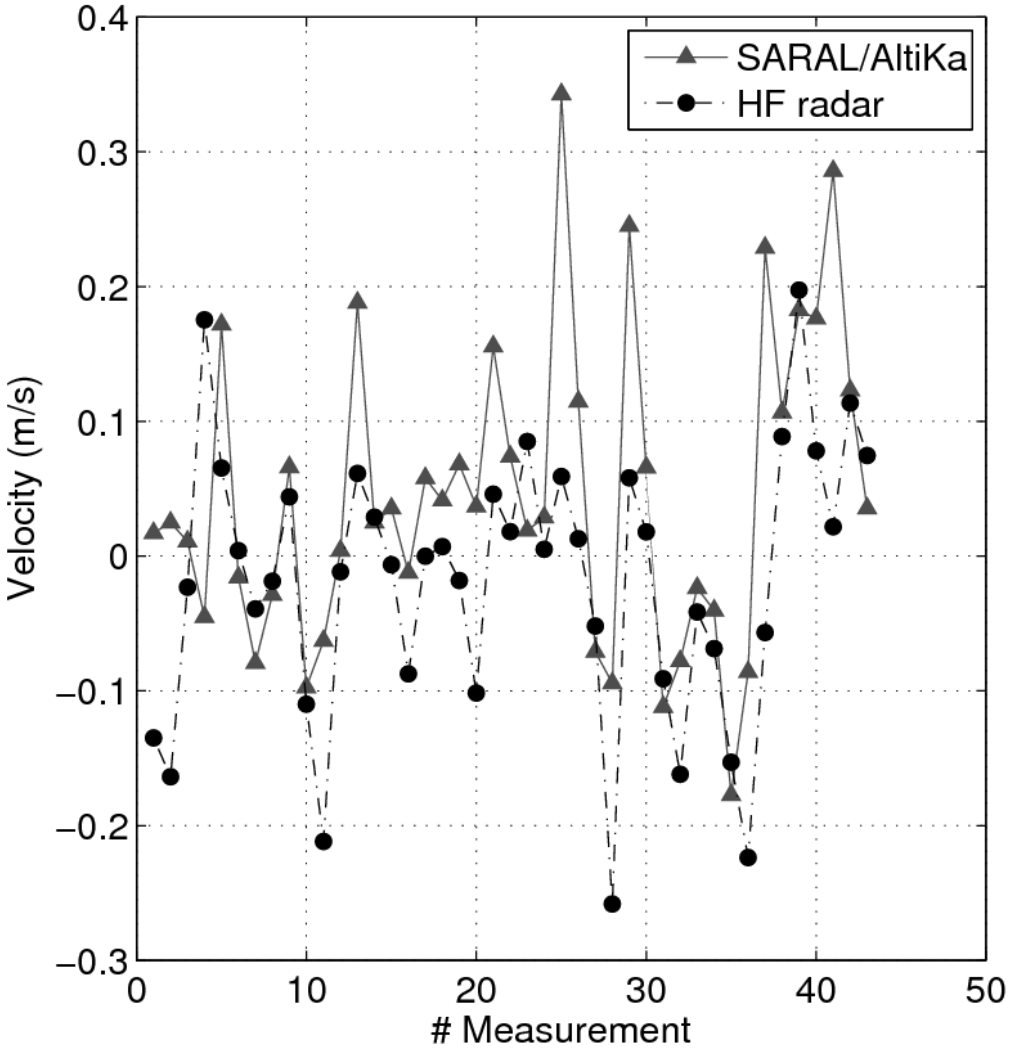

- R = 0.60
- Rms diff = 11 cm/s
- Differences due to several factors: instrumental radar errors, smooth effect during data processing, inaccurate altimeter corrections, non-geostrophic signals, suspicious coastal editing and low signal to noise ratio

Cross-track velocity for SARAL/AltiKa and HF radar data interpolated at the satellite measurement point.

Conclusions

- The standard AVISO near-real products evidence the emerging capabilities of SARAL/AltiKa in the coastal zone.
- Upcoming SARAL/AltiKa assessment studies should address the application of ad-hoc coastal-oriented altimeter corrections and high frequency data (review filtering and sub-sampling) for a better restitution of fine scale structures.
- This simple exercise can be expanded to other areas of the coastal ocean where HF radar data are available.
- NEW MDT AVAILABLE FOR THE MED SEA

National Oceanography Centre

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EUMETSAT

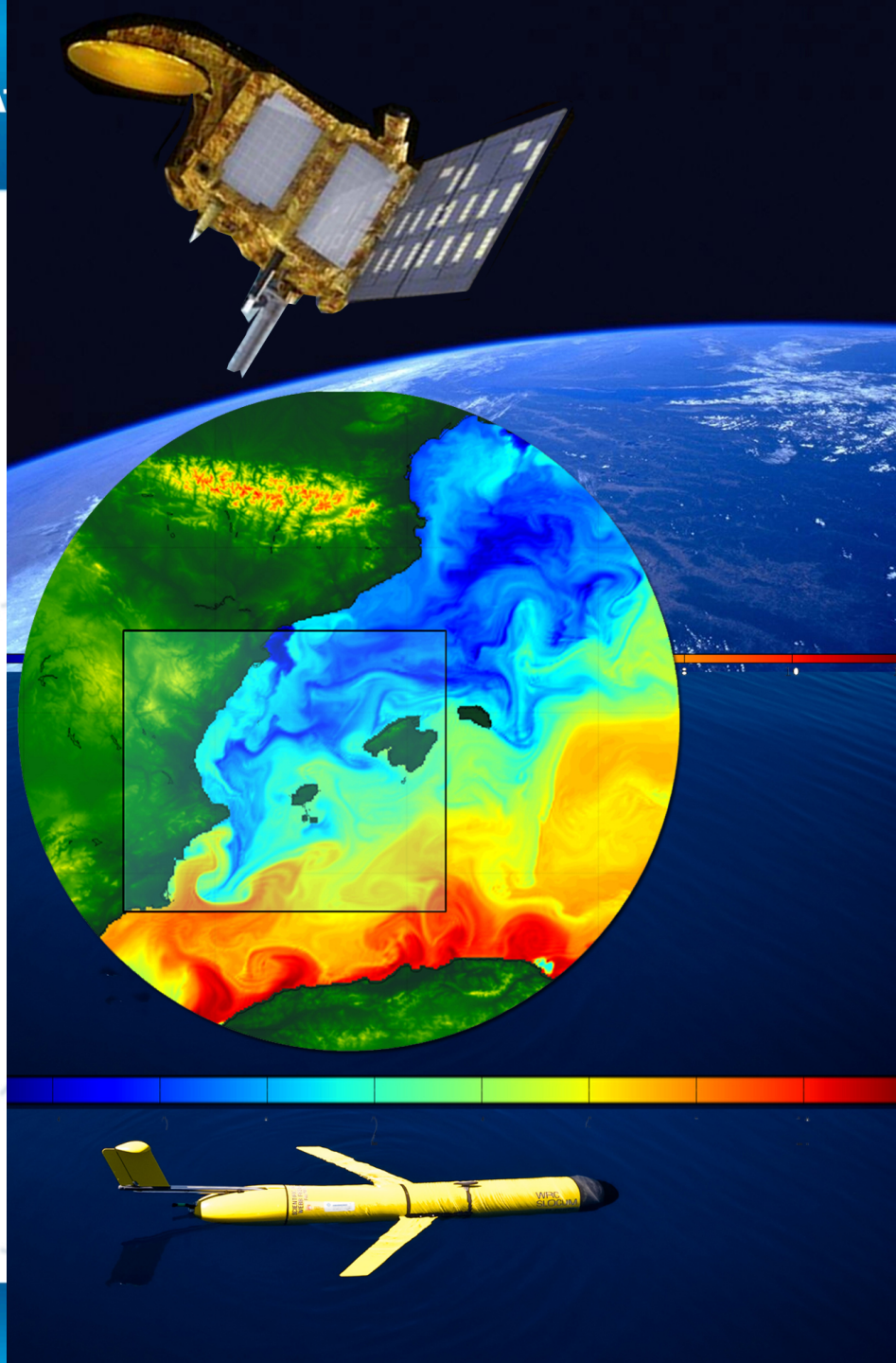
Challenges

Use and integrate new technologies and models to:

- Characterize the interannual and decadal variability at small scales

Requirements:

- Sustained HR in situ observations (gliders, HF radar, drifters, CTD, ARGO, …)
- Sustained HR satellite constellations (e.g. SWOT)
- Continuous improving of processing algorithms, and cross-validation exercises



Acknowledgments

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IMEDEA · CSIC Consejo Superior de Investigaciones Científicas · UIB Universitat de les Illes Balears · SOCIB Balearic Islands Coastal Observing and Forecasting System · CLS Collecte Localisation Satellites · myOcean · Seventh Framework Programme · Govern de les Illes Balears