WP2710-2740
Assessment on coastal retrackers and corrections

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Rationale

• The impact of Sea Level Rise (SLR) is maximum at the coast, but altimeters data in the coastal zone have traditionally been flagged out.

• So we ended up with rates of sea level rise from tide gauges (at the coast), rates over open ocean (from altimetry) – and a GAP in between.

• Progress in coastal altimetry in last 10 years has been steady:
  - see results presented at last week’s CAW-10
  - in particular: new retrackers such as ALES promise better performance

• In this WP we aim at filling the observational gap by extending the SLR measurements towards the coast (and seeing whether they make sense).
WP2710-40: aim

• The aim is to assess the capability of the altimeter measurement system (including retracking and corrections) to provide meaningful rates of SLR for climate applications in the coastal zone.

• The ultimate purpose is to achieve closure of the open ocean vs coast problem:
  - in perspective this can help estimate vertical land movement:
    \[ VLM = \text{rate(TG)} - \text{rate(alt)} \]

• this may also help to detect and characterize local processes that impact significantly on the local SLR.
What we have evaluated

- The impact of the ALES retracker on SLR estimation
- The impact of correction choices on SLR estimation

both the above are done taking several references as comparison, i.e.
- the gridded SL_cci products
- rates from SGDR (with the MLE4 retracker)
- rates from RADS

- The study is done over two separate regions (British Isles and Agulhas) and as a function of distance from the coast
Correction choices

- **our standard set:**

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<th>RADS</th>
<th>ALES</th>
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- **then 3 choices for Wet & Dry Tropo:** ECMWF, ERA, NCEP
Impact of retracker
Region 1 - British Isles

SSHA trends using RADS

SSHA trends using SGDR

SSHA trends using ALES

Robust Regression Trends around the U.K.

Sea Level CCI 3rd Annual Review   February 27th-28th 2017
Robust Regression Trends 2002-2015

Mean/Median of all British isles tracks

- median ALES
- median SGDR e Orbit Range
- median RADS
- median CCI
- mean CCI

Closest approach distance to coastline (km)

Trend (mm/y)

Mean/Median of all British isles tracks
Robust Regression Trends 2002-2015

with GIA trends applied

GIA from Richard Peltier
University of Toronto

dsea250.1grid.ICE5Gv1.3_VM2_L90_2012
Median rate from TGs 1.79 mm/yr
Site 2: Agulhas Region

SSHA trends using RADS

SSHA trends using SGDR

SSHA trends using ALES

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Impact of corrections
Different Wet Tropo

UK SSHA trends, with ECMWF Wet Trop Corr

- RADS
- SGDR
- ALES

Reference (ECMWF)
Different Wet Tropo

UK SSHA trends, with ECMWF Wet Trop Corr

UK SSHA trends RADS with varied Wet Trop

UK SSHA trends SGDR with varied Wet Trop

UK SSHA trends ALES with varied Wet Trop

Referen

Trend (mm/y)

Closest approach distance to coastline (km)
Sensitivity of SSHA trends with varied Wet Tropo around U.K.
Sensitivity of SSHA trends with varied Dry Tropo around U.K.
Sensitivity of the Agulhas SSHA Regional trends with varied Wet Tropo 2003-2015

Sea Level CCI 3rd Annual Review   February 27th -28th 2017
Sensitivity of the Agulhas SSHA Regional trends with varied Dry Trop 2003-2015
Key Findings

• sensitivity to choice of retracker <0.2-0.3 mm/yr offshore and < 0.4-0.5 mm/yr in the last 5 km

• ALES gives closest results to median TG rate (around the British Isles)
  - and less variable SLR than SGDR in the last few km
  - SLR along Agulhas tracks show huge variability in the last few km

• sensitivity to choice of Wet Tropo <0.3 mm/yr for various models (around the British Isles)
  - larger in the Agulhas Region >0.5 mm/yr
  - need to investigate effect of GPD+

• sensitivity to choice of Dry Tropo < 0.2 mm/yr for various models (around the British Isles)
  - larger in the Agulhas Region ≈ 0.5 mm/yr
THANK YOU
Effect of along-track filtering of the data

Comparison of Hamming Filter windows, Pass 005, Agulhas

Comparison of Hamming Filter windows, Pass 020, Agulhas