Sea Level CCI project

Phase II

1st annual review
SL_cci Database extension

[1993,2010]+[2011,2013]

• Altimeter Database principle: description of main steps to extend the altimeter database

• Validation results (RRDP):
  ⇒ Analyses of GPD corrections provided by J. Fernandes over the [2011-2013] period

  ⇒ Analyses of atmospheric corrections derived from ERA-interim over the [2011-2013] period
SL_cci database extension

[2011-2013] period = 7 years of altimeter data ⇔ 150e6 1Hz data ⇔ 100 Giga-octets

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SL_cci database extension

- Altimeter Level-2 products (GDR)
- Update altimeter corrections (geophysical, instrumental)
- Editing
- Valid sea level ocean flag
- RRDP reports
- Acquisition
- Altimeter database
SL_cci database extension

- **Ocean Tide:**
  - GOT4V8,
  - GOT4V10,
  - FES2012

- **Dyn. Atm. Corrections:** ERA-Interim

- **Wet Tropo. Corrections:**
  - GPD,
  - ERA-Interim,

- **Dry Tropo. Corrections:**
  - ERA-Interim

- **Orbits:** CNES

- **Mean Sea Surface:**
  - CNES/CLS, DTU

**Standards download or computation**

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- Substantial IT resources
- Consolidation and parallelization of algorithms

Conversion to internal format if needed

Database update

Envisat

Jason-1

Jason-2
SL_cci database extension

- Logs
- Statistics for each standard

- (Round Robin Data Package): multi-mission and multi-diagnoses tool
- Extended and new RRDPs available on esa-sealevel-cci.org
Comparison of ERA-Interim and « operational » ECMWF models via Atmospheric Corrections

⇒ 6 RRDP for 3 corrections (DAC, DT, WT) for 2 periods
⇒ available on SL_cci ftp site (and website)

RRDP_WP2600_DAC_ERA_Interim_vs_ECMWF_1993-2013_14-08-27.pdf
RRDP_WP2600_DAC_ERA_Interim_vs_ECMWF_2011-2013_14-05-20.pdf
RRDP_WP2600_DryTropo_ERA_Interim_vs_ECMWF_1993-2013_14-08-27.pdf
RRDP_WP2600_DryTropo_ERA_Interim_vs_ECMWF_2011-2013_14-05-20.pdf
RRDP_WP2600_WetTropo_ERA_Interim_vs_ECMWF_1993-2013_14-08-27.pdf
RRDP_WP2600_WetTropo_ERA_Interim_vs_ECMWF_2011-2013_14-05-20.pdf
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Dynamical Atmospheric C. (Era interim vs. op. ECMWF fields)

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\[
\text{SSH Error Reduction} = \text{sign}(\Delta \text{Var}\{\text{SSH}\}) \star \sqrt{\frac{|\Delta \text{Var}\{\text{SSH}\}|}{2}}
\]

Dynamical Atmospheric C. (Era interim vs. op. ECMWF fields)

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Only Period [2011, 2013]
VAR(SSH with ERA) - VAR(SSH with ECMWF)
Mission j2, cycles 93 to 200

Dynamical Atmospheric C. (Era interim vs. op. ECMWF fields)

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Dry Troposphere C. (Era interim vs. op. ECMWF fields)
SL_cci database extension

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SSH crossovers: difference of variances (cm^2)

Dry Troposphere C. (Era interim vs. op. ECMWF fields)

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Not Used in SL_cci calculation

Wet Troposphere C. (Era interim vs. op. ECMWF fields)

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Mission j2, cycles 93 to 200

SSH crossovers: difference of variances (cm^2)

Wet Troposphere C. (Era interim vs. op. ECMWF fields)

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• Wet tropospheric correction comparison for ENVISAT, Jason-1, Jason-2 missions between GPD (J. Fernandes, FCUP) and radiometer corrections

⇒ 1 RRDP provided:

RRDP_WP2600_Coast_GPD_vs_Radiometer_14-08-21.pdf
• GPD correction extension shows performances equivalent on [2011,2013] period:

⇒ Performances at crossovers are equivalent and the analysis of MSL shows no degradation nor improvement over this brief period.

<table>
<thead>
<tr>
<th>Climate Applications</th>
<th>Temporal Scales</th>
<th>Envisat GPD Versus RAD</th>
<th>Jason-1 GPD Versus RAD</th>
<th>Jason-2 GPD Versus RAD</th>
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<tbody>
<tr>
<td>Global Mean Sea Level</td>
<td>Long-term evolution (trend)</td>
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<td>Inter annual signals (&gt; 1 year)</td>
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<td>Annual and semi-annual Signals</td>
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<td>Regional Mean Sea Level</td>
<td>Long-term evolution (trend)</td>
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<td>Signals &lt; 2 months</td>
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</table>
SL_cci database extension

Map of Variance differences of Sea Surface Height at crossovers between the GPD and Radiometer corrections (over all the period):
- Significant improvement in Indian and East Pacific Oceans

Temporal evolution of Variance differences of Sea Surface Height at crossovers between two GPD corrections:
- Strong improvements over all the extended period (cycles 95-113)
- Important differences between the difference of SSH at crossovers before and after cycle 95.
Map of Sea Level Anomaly differences between two GPD corrections (over all the period)
Map of Sea Level Anomaly differences between two GPD corrections (over all the period)

SLA with GPD trends - SLA with RAD trends

Mission j2, cycles 86 to 200
• Conclusion

⇒ Altimetry databases updated until 2013 included
⇒ FCDRs version 1.1 are available for all the missions users in SL_cci website
⇒ Next extension of altimetry database [1993-2014] in version 1.1 is planned by the end of the year (December 2015)

⇒ Only 1 altimeter mission is available in SL_cci from mid-2013 onwards (Jason-2) : no data in high latitudes (66 deg) after mid-2013

⇒ In altimetry database version 2.0, others altimetry missions will be integrated:
  - SARAL/Altika : available (SALP project)
  - Cryosat-2 : L2P products ?
    - ESA IOP/GOP? => required < June 2015!
    - CNES CPP reprocessed product [2011-now] => CNES autorisation to be asked by ESA