Absolute altimeter bias results from Bass Strait, Australia

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Bass Strait _ Validation Facility







Ocean Surface Topography Science Team Meeting

September 24-29 2018

Ponta Delgada Azores Archipelago, Portugal



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Bass Strait Approach:





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Datum Determination (Buoy - S3A Mooring):

- Homogeneous reprocessing of buoy data.
- S3A CP is cross-over between passes 060 & 247
- ~9 km from Jason-series CP
- Reprocessing reduced variability from ±16 to ±14 mm







Datum Determination (Buoy - JAS Mooring):

• Filtered buoy – mooring yields the mooring datum offset with noise contributions from both sensors...





Buoy Processing Examples:





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May15

Aug15

- Deployments on May 2015 and Aug 2015 represent examples of "well behaved" and "challenging" solutions, respectively.
- Is the diurnal signal in the Aug 2015 residual related to GPS or mooring data?
- Our processing approach uses doubledifferenced carrier phase processing (MIT / TRACK). How do the results compare to a PPP approach? (thanks to B.Haines for PPP solutions)

Buoy Processing Examples:







- Deployments on May 2015 and Aug 2015 represent examples of "well behaved" and "challenging" solutions, respectively.
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- Our processing approach uses doubledifferenced carrier phase processing (MIT / TRACK). How do the results compare to a PPP approach? (thanks to B.Haines for PPP solutions)
 - Comparable results between analysis strategies.
 - Some common mode signal evident, still difficult to disentangle GPS vs in situ origin.

Buoy Processing Examples (ΔSSH)

- 15 deployments (645 hours, ~27 days) where we have 2 buoys within 20-40 m of each other.
- Each buoy is processed independently, but using the same reference stations.
- We compare low pass filtered data (20 min filter to attenuate swell, 5 min sampling), **i.e. expect ΔSSH = 0.**





 Dominated by differences from 4 deployments, but provides important constraints when using buoys for ΔSSH...



New Technology: 3D ADCP at S3B site







Absolute Bias at Bass Strait (vs TG)

(expect higher variability than against mooring).





Absolute Bias at Bass Strait (vs Mooring)





Absolute Bias at Bass Strait (vs Mooring)

• S3A Baseline 3, Non time critical data via RADS. Cross-over between passes 060 & 247.







S3A SAR Absolute Bias

- S3A Baseline 3, Non time critical data via RADS.
- Bias reduction of ~20 mm from ~36 mm (Baseline 2) to ~16 mm (Baseline 3).
- Bias from asc/desc passes are equivalent. Bias variability approaching in situ noise.







S3B SAR Absolute Bias



- S3B data via RADS compared to S3A comparison point (formation flight)
- No significant differences observed.
- Preparations at S3B comparison point well advanced (GNSS buoy, moorings, 3D ADCP...)







S3A PLRM Absolute Bias

- S3A PLRM bias (~26 mm) is higher than SAR bias (~16 mm)
- S3A PLRM bias variability (~28 mm) is higher than SAR (~22 mm)





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S3A CP

RKC

(40°33'S 145°345'E

Historical CP (JAS)

S3B CP

(40°33.5'S, 145°06'E)

STLY

Conclusions from Bass Strait

- Buoy reprocessing effort has improved the quality of the Bass Strait absolute bias datum:
 - Variability down from ±24 to ±19 to ±17 mm.
- Issue with wet delay comparisons against land based GPS reported at last OSTST is now resolved (no impact on our bias data stream).
- Jason-3 GDR-D bias is insignificantly different from zero (-7 mm). Error bar likely ±10-15 mm.
- S3A SAR bias (Baseline 3) is +16 mm (reduced by 20 mm from Baseline 2). No significant differences for S3B (very small sample).
- Jason-1 GDR-E remains significantly different from zero and requires further understanding.

| Mission | Cycles | Absolute Bias | Std Dev |
|---------------------|--------------------|-------------------------|---|
| TOPEX-A | 1 -> 235 | +8 mm | 24 mm (TG*) |
| TOPEX-B | 236 -> 365 | +19 mm | 27 mm (TG*) |
| Jason-1 GDR-E | 1 -> 259 | +47 mm | 30 mm (TG*) |
| Jason-2 GDR-D | 1 -> 298 | +19 mm +18 mm | 32 mm (TG) 25 mm (Mooring) |
| Jason-3 GDR-D | 1 -> 87 | -5 mm -7 mm | 29 mm (TG) 27 mm (Mooring) |
| S3A SAR S3A PLRM | 3 -> 34 3 -> 34 | +16 mm +26 mm | 22 mm (Mooring) 28 mm (Mooring) |

 \ast Solutions adopt VLM of -0.7 mm/yr at the tide gauge









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Aftermath. Looking towards the steps where footage on the left was taken

Moment of flash flood rushing

into the ground-floor of the

UTAS Engineering building

Questions?

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