TOPEX/Poseidon *and* Jason-1

absolute calibration in Bass Strait, Australia

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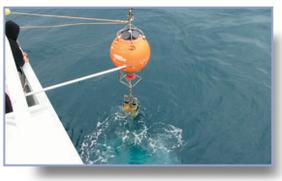
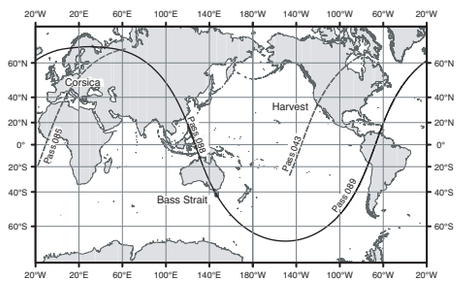


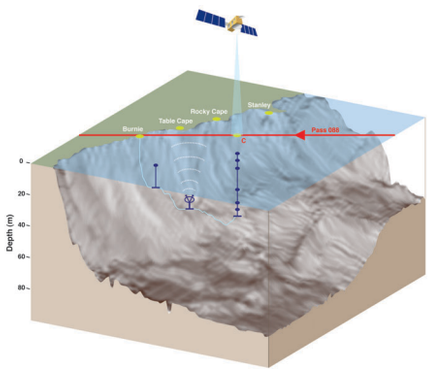
Abstract

The Bass Strait site, under descending pass 088, is the sole *in-situ* calibration facility for TOPEX/Poseidon and Jason-1 in the Southern Hemisphere.

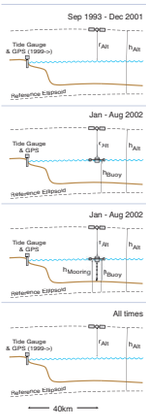
Our calibration activities include the regular deployment of two GPS buoys approximately 40 km from Burnie. Data from each buoy deployment has been used to solve for the vertical datum of an oceanographic mooring array, which was deployed for the duration of the Jason-1 calibration phase. The GPS buoy constrained mooring SSH time series allows the computation of absolute bias on a cycle by cycle basis. The continuous mooring SSH time series has been used to correct the Burnie tide gauge, effectively translating the tide gauge time series to the comparison point. This methodology has been extended to allow comparison with TOPEX/Poseidon from 1992 to the orbit manoeuvre in August 2002, and Jason-1 from launch to present.



The Bass Strait (Burnie) calibration site has been running since the TOPEX/Poseidon launch in August, 1992.



During the "Formation Flight" period (January to August, 2002) when Jason-1 and TOPEX/ Poseidon were flying over the same ground track with Jason-1 approximately 70 seconds ahead of TOPEX/Poseidon we deployed an array of oceanographic instruments off Burnie.



TOPEX/Poseidon alone

- tide gauge at Burnie, about 40km from comparison point
- vertical position of tide gauge from combination of GPS and traditional surveying techniques (continuous GPS added in 1999)
- major problem is poor knowledge of the geoid
- height differences due to tidal and other oceanographic effects are a (lesser) problem

Formation flight (both satellites on same ground track, 70 seconds apart) – January to August, 2002

- four hour GPS buoy deployments in combination with permanent GPS at Burnie and two other temporary GPS stations nearby
- geoid slope directly measured
- major problem is the small number of deployments (5)

Formation flight – January to August, 2002

- oceanographic instruments on mooring under comparison point give continuous, high accuracy SSH time series, fixed vertically by GPS buoy deployments
- many more comparisons
- much better knowledge of differences between coastal tide gauge and comparison point

All times

- improved knowledge of geoid height differences and tidal differences gives much better long-term estimates of absolute bias

TOPEX/Poseidon altimeter processing, MGDR-B data with all path-length corrections:

- TMR brightness temperature calibration and yaw state correction
- TMR wet troposphere correction extrapolated inshore because of near-shore contamination
- ionosphere correction (smoothed)
- dry troposphere
- sea-state bias
- centre of gravity

Jason-1 altimeter processing, GDR data with all path-length corrections:

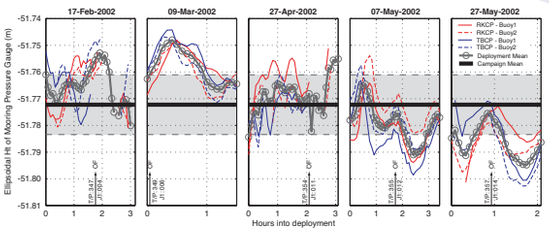
- JMR wet troposphere correction extrapolated inshore because of near-shore contamination
- ionosphere correction (smoothed)
- dry troposphere
- sea-state bias

Oceanographic processing

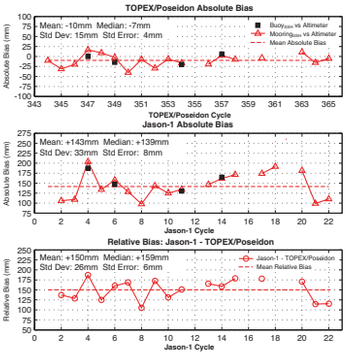
- atmospheric pressure (adjusted to comparison point) removed from pressure gauge pressure
- pressure converted to SSH using density profile

GPS processing – two main processing stages

- absolute positioning of the GPS reference sites in a global terrestrial reference frame using GAMIT/GLOBK in a regional network solution
- kinematic positioning of the GPS buoys on an epoch-by-epoch basis using MIT's TRACK software. Independent GPS buoy solutions were produced allowing some level of quality control of the resulting sea surface height time series
- IERS2000 standards were used for loading corrections (earth body tides, ocean loading, *etc*)



Results of the GPS solutions, relative to the mooring-derived SSH, for the five GPS buoy deployments. The solid horizontal line is the mean over all deployments and the heavy grey lines show the mean of all four solutions (2 x GPS buoys vs 2 x GPS ground stations) for each deployment. The solid and dashed coloured lines show the four separate solutions.



Our bias estimates are:

TOPEX/Poseidon	-10 ± 10 mm
Jason-1	143 ± 10 mm
Relative (Jason-1 - T/P)	150 ± 12 mm*

*from common cycles

Conclusions

The data from the period when the oceanographic instruments were deployed (the same as the initial Jason-1 calibration period) has improved our knowledge of the geoid slope and of the height differences between the coastal tide gauge and the off-shore comparison point, allowing us to produce better long-term estimates of bias. Our results are slightly different from the results from the other dedicated sites. While these differences are of similar magnitude to the error bars, they are also consistent with geographically correlated differences seen in other analyses.

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