TOPEX/ Poseidon and Jason-1 Satellite Altimeters: Absolute Calibration in Bass Strait, Australia

Introduction
The joint NASA/CNES TOPEX/Poseidon (T/P) and Jason-1 satellite altimeters are invaluable for a wide range of oceanographic and climatological studies. They have become the tool of choice for the study of global sea-level change.

Maintaining continuity between altimeter missions requires careful calibration using in situ measurements. The Bass Strait calibration site is the sole in situ calibration site for T/P and Jason-1 in the Southern Hemisphere.

Methodology
During the calibration phase of the Jason-1 mission (January through August 2002), Jason-1 was positioned on an identical ground-track to T/P, leading by approximately 70 seconds. The satellites pass over the same ground track every cycle (10 days) and measure Sea Surface Height (SSH) from an altitude of around 1340 km, precise to 30-35 mm.

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To calibrate the altimeter-derived measurement, SSH is measured using ground based observations in Bass Strait:
- A coastal tide gauge (located at the Burnie wharf from 1992),
- Two GPS buoys (deployed episodically at the comparison point approximately 40 km north west from Burnie),
- Three land based GPS reference stations, and

Geographically Correlated Error

Results over Jason-1 cycles 1-60 (to August 2003) reveal differences depending on the choice of orbit (+148 mm for the GDR orbit and +311 mm for the Jet Propulsion Laboratory (JPL) GPS orbit). This difference is due mainly to differences in the underlying gravity field models (GEOS-3 and GGM05S).

Conclusions
The use of GPS buoys combined with an oceanographic mooring array provides a unique calibration technique for determining absolute altimeter bias. The limiting error sources are the systematic error in the GPS reference station analysis, followed by uncertainty of the altimeter SSH estimates. The significant bias (~150 mm) present in the Jason-1 data remains unexplained.

After considering geographical differences associated with orbit computation, bias estimates from Harvest and Bass Strait agreed within estimated uncertainties. Bias estimates from Harvest and Bass Strait agree to within ±1 standard deviation (11 mm).

References

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