BASS STRAIT IN-SITU CALIBRATION SITE:

TRIALS OF THE FRENCH TRANSPORTABLE LASER RANGING SYSTEM (FTLRS)

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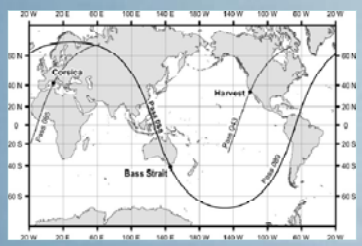

Fig.1 The calibration site is located under Jason-1 descending pass 088. The offshore comparison point is located at 40º 38'45"S 145º35'43" in Bass Strait[3].

Fig.2 The Burnie tidal gauge and co-located CGPS. A second "bedrock" CGPS is located at Round Hill approximately 5km away.

Fig.7 Episodic GPS station at Rocky Cape used during a GPS buoy deployment

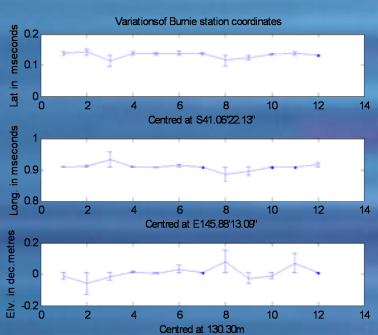

Fig.10 Variation of the FTLRS Burnie coordinates resolved from arcs of the Jason-1 orbit using the GINSPC/DANAMO software package.

Introduction

The Bass Strait in-situ calibration site has been used in the calibration and validation of satellite altimeter data since the launch of TOPEX/Poseidon in 1992 [1][3][4]. The primary focus at the site has been the estimation of absolute bias in altimeter derived sea surface height (SSH) using a combination of oceanographic moorings, GPS buoy deployments, coastal tide gauge and land based GPS data. As the sole site of its kind in the Southern Hemisphere, the Bass Strait site provides important input into understanding various error sources in satellite altimetery.

With an objective of improving our understanding of any geographically correlated orbit errors present in altimeter orbits, the Bass Strait site was selected as part of a collaborative French/Australian project to trial the French Transportable Laser Ranging System [1] (FTLRS). The FTLRS was operated in Tasmania over a five month period between 1 December 2007 to 17 April 2008 jointly by French and Australian staff.The FTLRS and temporary GPS installation were located within the city of Burnie close to the Jason-1 descending pass 088, several kilometers from the Burnie tide gauge/CGPS and inland CGPS sites.

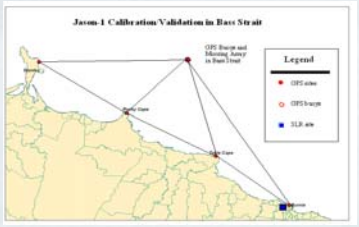

Fig.3: In addition to CGPS sites at Burnie and Round Hill, episodic GPS stations are used during the GPS buoy deployments. This enables accurate kinematic positioning of the GPS buoys which are then used to define the ITRS datum of the oceanographic mooring at the comparison point.

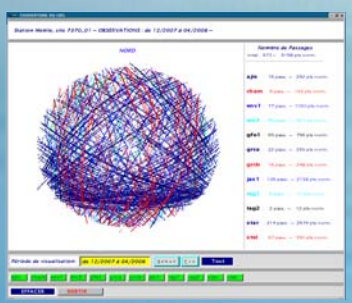

Fig.4 During the Tasmanian FTLRS campaign, a total of 673 over flights from 12 different satellites were observed and a total of 9200 normal points have been computed

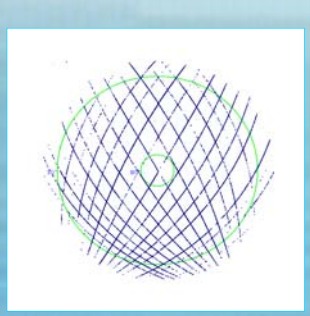

Fig.5 Sky-plot of the FTLRS tracked Jason1 pass over Burnie. (Total: 106 pass, 2158 norm points)

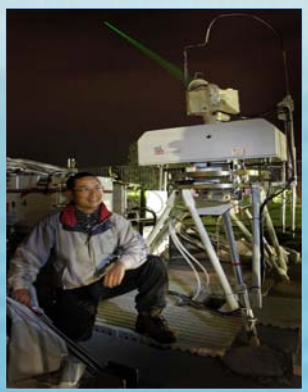

Fig. 6 FTLRS in operation at night

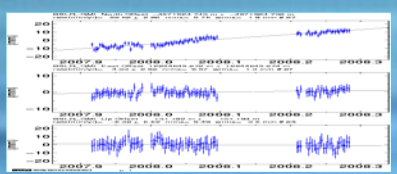

Fig.8 Three dimensional velocity time series at the GPS pillar co-located at the FTLRS Burnie site.

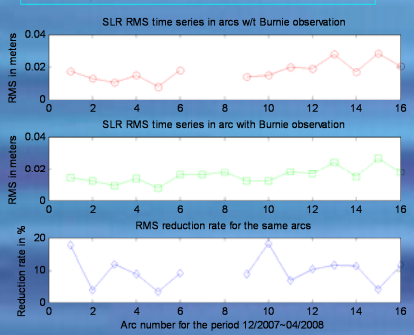

Fig.10 Difference SLR RMS of Jason-1 orbit determination

We observed a consistent reduction in RMS when the Burnie FTLRS data was included in the orbit solution, highlighting a significant contribution of the Burnie site to the global solution of Jason-1's orbit. The gap in Fig.10-1 is due to abnormal RMS for two arcs in January, where without Burnie, the RMS are around 10cm.

Conclusions

Our initial results using the GINSPC and DYNAMO suite shows an extra SLR station in Bass Strait calibration site reduces significantly the RMS of the SLR solutions when estimating the orbit of Json-1.The averaged reduction rate is over 10%.

We observed that in two arcs in January, with the measurements from FTLRS the RMS are 1.61 cm and 1.79 cm respectively; without the inclusion of the Burnie FTLRS, the RMS jump sharply to 10.68 cm and 9.06 cm using the same settings in GINSPC. This may be due to the instability of the orbit determination or due to the absence of observations from the Mt Stromlo site. We are currently experimenting with solutions by excluding Mt Stromlo's observations in order to clarify these results.

Due to the uneven ground distribution of the SLR tracking stations, it is desirable to have more SLR stations in the Southern Hemisphere. Whilst building SLR capacity in Australia, we seek to highlight the influence of an additional tracking station in this region.

The intensive data analysis phase of this project has only recently started. Our FTLRS based orbits will assist in quantifying regional or geographically correlated orbit errors present in satellite altimeter data, allowing the improved understanding of the absolute bias of the Jason-1 mission at the Bass Strait calibration site.

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Reference:
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