The Calibration and Validation Result of HY-2B/C Altimeter through the Wanshan CAL/VAL Site in Zhuhai, China

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Abstract

The Wanshan Calibration and Validation (CAL/VAL) site is a dedicated site designed for the Chinese HaiYang-2 satellite altimeters. It was built in late 2019 and has been running over 4 years. The site consists of a large sea area and several islands located in the south of Zhuhai, China. In order to support precise CAL/VAL service for the HaiYang-2 satellite altimeters, we established multiple permanent altimetry calibration facilitiy (PFAC) in Wanshan Islands with the ground measurements of FRM-quality.

At present, various of facilities have been established in this CAL/VAL site, including four GNSS receivers, three acoustic tide gauges, and an automatic weather station. Besides, we are planning to establish a GNSS buoy on the cross track sub-satellite point of HY-2B and HY-2C in the future. Furthermore, the Data Reception and Maintenance Center is established in the Guishan Island for the collection, summary, management and transmission of the observation data. The aim of the PFAC are as follows:

(1) Four GNSS reference stations are established respectively in the Wailingding Island, the Dangan Island, the Zhiwan Island and the Miaowan Island, which provides the absolute elevation reference for the tide-gauges and the GNSS buoy.

(2) Three acoustic tide gauges are respectively located in Wailingding Island, Dangan Island, Zhiwan Island. They directly provide the observation data of the sea level for the CAL/VAL of the altimeters.

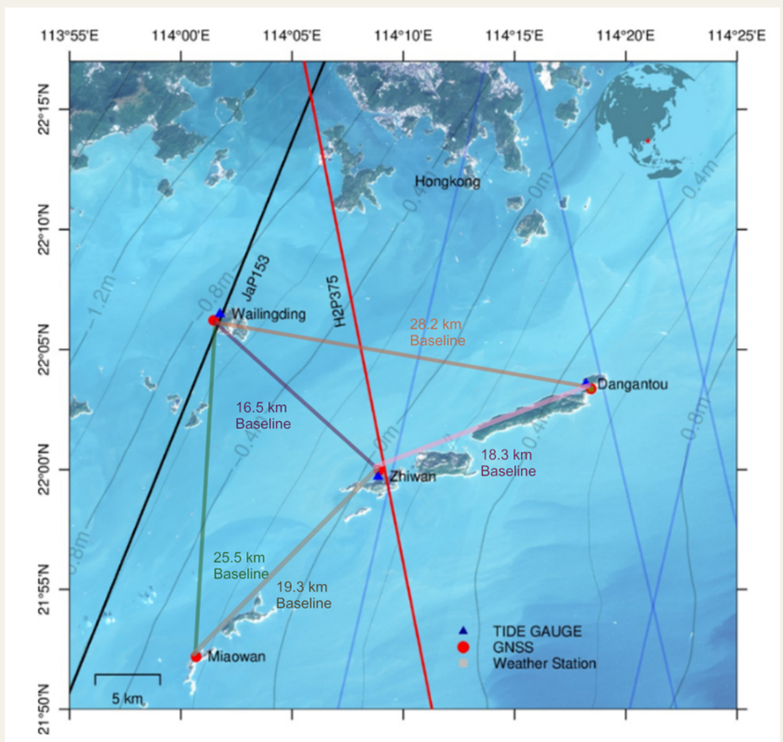
(3) An Automatic weather station established in Dangan Island, provides wind, atmospheric pressure, air temperature, water vapor observation parameters and other auxiliary observation parameters for altimeters' tropospheric delay validation. Besides the HY-2B and HY-2C, Wanshan CAL/VAL site could also provide CAL/VAL service for other spaceborne radar altimeters, such as Jason-3 and Sentinel-3.

By using the tide gauge in Zhiwan Island, we made a long-term CAL/VAL for HY-2B and HY-2C altimeter. The over 4-year result shows that the measurement of both altimeters is quite stable and accurate. T he bias of HY-2B is 1.72cm±0.47cm and the bias of HY-2C is -0.42cm±0.50cm.

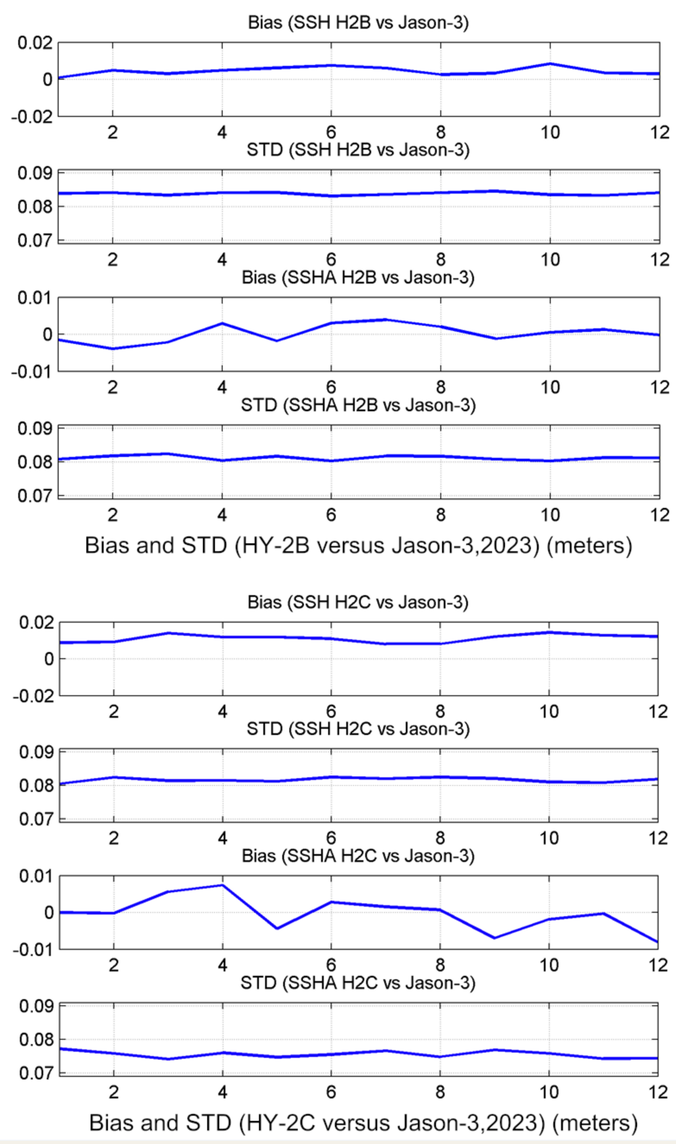
Our cross-over CAL/VAL of HY-2B and HY-2C versus Jason-3 during the year of 2023 gives the same result which shows the stability. The bias of HY-2B versus Jason-3 is 0.45cm±8.38cm and the bias of HY-2C versus Jason-3 is 1.21cm±8.16cm.

Site Arrangement

***Guishan Island** (Data Centre)
***Wailingding Island** (TG&GNSS)
***Zhiwan Island** (TG&GNSS)
***Dangan Island** (TG&GNSS)
***Miaowan Island** (GNSS)

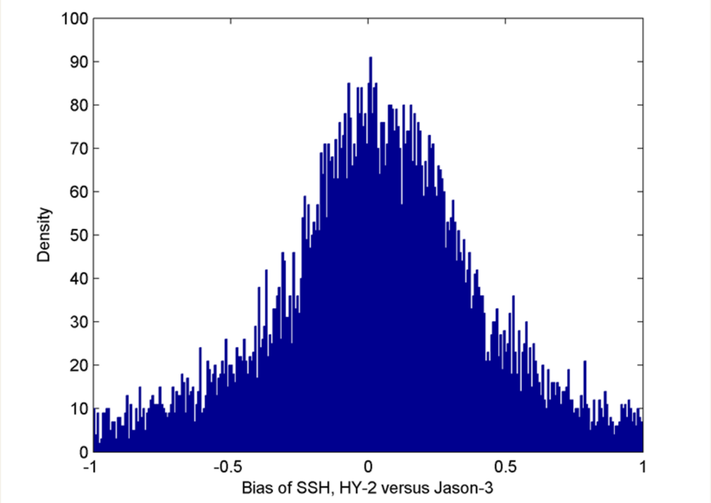


Cross-over CAL HY-2B/C vs Jason-3

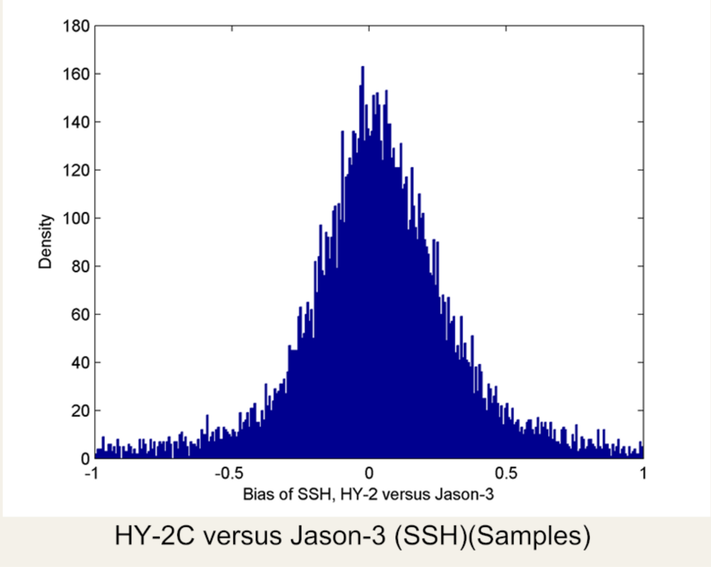


Cross-Over CAL/VAL	Bias(cm)	STD(cm)
HY-2B vs Jason-3	0.45	8.38
HY-2B vs Jason-3 (SSHA)	0.02	8.12

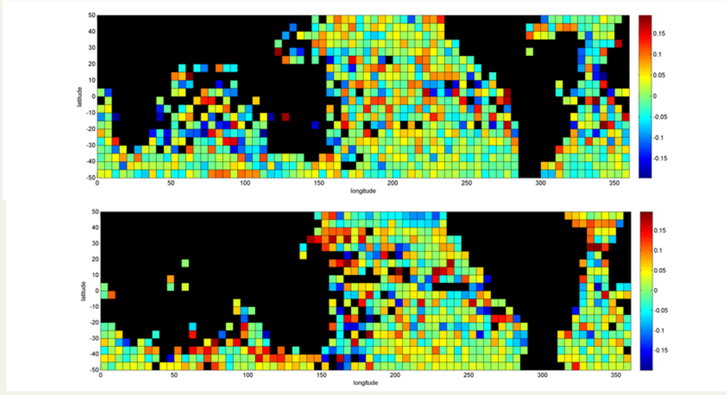
Cross-Over CAL/VAL	Bias(cm)	STD(cm)
HY-2C vs Jason-3	1.12	8.16
HY-2C vs Jason-3 (SSHA)	-0.32	7.55



HY-2B versus Jason-3 (SSH) (Samples)



HY-2C versus Jason-3 (SSH)(Samples)



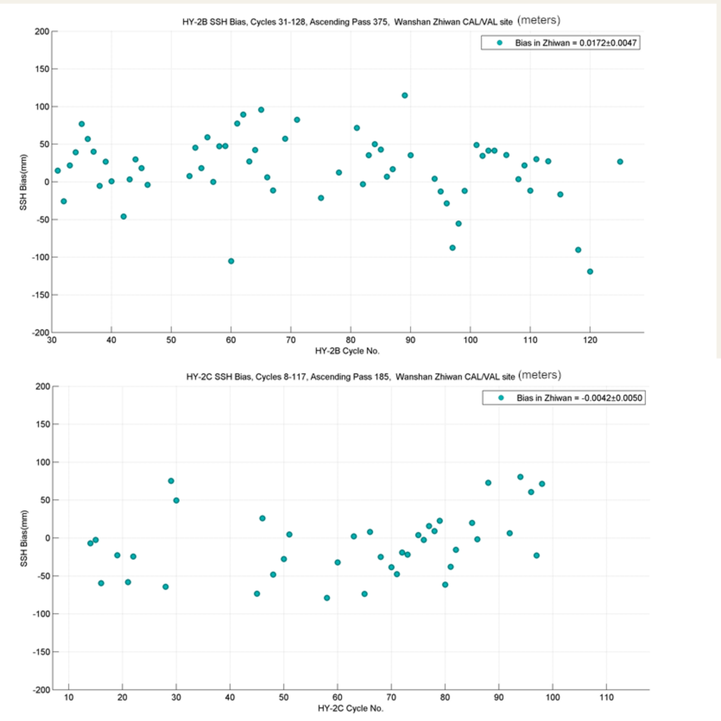
Permanent Altimetry Calibration Facilities

Pressure Tide Guage — Acoustics Tide Gauge (WLD)

GNSS Buoy — GNSS Station (WLD)

Data Reception and Maintenance Center (GSH)

Calibration Results



Future Plan

*More tide gauges

*GNSS buoy array for KaRin CAL/VAL

*Transponders on different islands

*Tide gauges CAL/VAL for KaRin

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