Geodetic Infrastructure in the Ibiza and Barcelona Harbours for Sea Level Monitoring

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Abstract

The presentation is directed to the description of the actual situation and relevant information of the geodetic infrastructure of Ibiza and Barcelona sites for sea level determination and contribution to regional sea level rise. Time series are being analysed for mean sea level variations www.puertos.es.

In the framework of a Spanish Space Project, the instrumentation of sea level measurements has been improved by providing the Barcelona site with a radar tide gauge Datamar 2000C from Geonica s.l. near an acoustic tide gauge. Puertos del Estado installed in 2007 a MIROS radar tide gauge and the Barcelona Harbour Authority a GPS referente station in the roof of the new Control Tower situated in the Energy Pier. The radar sensor is over the water surface, on a L-shaped structure which elevates it a few meters above the quay shelf. 1-min data are transmitted to the ENAGAS Control Center by cable and then sent each 1 min to Puertos del Estado by e-mail. There is a GPS station Leica Geosystems GRX1200 GG Pro and antenna 1202. Precision levelling has been made several times in the last two years because the tower is founded in reclaimed land. The measured settlement rate is about 1cm/year that may be could mask the values registered by the tide gauge.

A description of the actual infrastructure at Ibiza harbour at Marina de Botafoch, is presented and its applications to sea level monitoring and altimeter calibration in support of the main CGPS at Ibiza harbour. It is described the geometrical precision levelling made in June 2013 between the radar tide gauge and the GPS station.

In particular, the CGPS located at Ibiza harbour is essential for its application to the marine campaign Baleares 2013, near Ibiza island. The main objective is to determine the altimeter bias for Jason-2, about 9:09 UTC September 15, 2013, and Saral/AltiKa, about 05:30 UTC September 16, UTC.

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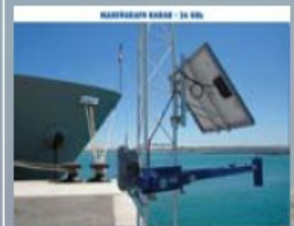
1.- Barcelona and Ibiza calibration sites

RADAR TIDE GAUGE DATAMAR 3000C

The tide gauge unit is powered by internal batteries to be recharged by an optional solar panel or by the mains 220 / 110 V – 50/60 Hz. In the case of mains failure, the internal batteries will allow the unit to still continue to work during several days, depending on the power drain conditions and sensors installed.
n order to assure a high accuracy of the internal clock, very important for tide data intercomparison, the TIDE-GAUGE recorder incorporates a GPS receiver for automatic clock synchronization. This allows a time accuracy in the order of 40 nanoseconds, suffering only a short but constant synchronization delay of some milliseconds. It is intended that the overall system will constitute a CGPS station of the TIGA (GPS Tide Gauge Benchmark Monitoring) network.



General view of the levelling traverse conducted in 2009 and repeated in September 2011 (red line, about 700 m along the northern side of the "Energy Pier", Barcelona harbour, Spain). The levelling chain links point #124 (Levelling Network XdA), the **Tide Gauge** (point #146) and the Harbour Control Tower (**NO** point is located at the ground floor of the Tower, whereas the GPS Station- ARP point- is at its roof). Source of the orthophotomap: Institut Cartogràfic de Catalunya.

2. IBIZA Altimeter Calibration Campaign 2013

A levelling traverse was conducted in the Ibiza Marina de Botafoch harbour in June/September 2013 to link the radar MIROS tide gauge and the GPS permanent station with the levelling network in the area. In the present work, the last chain was repeated in order to confirm the results of June 2011 from the Instituto Geografico Nacional IGN and to detect the possibility of settlements.

The main objective for the Geodetic Infrastructure of Barcelona and l'Estartit harbours, together with the main site of Ibiza harbour, is their scientific contribution to the marine campaign of 2013. A possible geographic area would be the west Mediterranean Sea (image courtesy of Dr. Richard Biancale (CNES/LEGOS). It is possible to make in part a campaign like IBIZA2003 (image courtesy of Dr. Pascal Bonnefond et al., OCA/GRGS).
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The CGPS locatedatIbiza harbour is essential for its application to theupcoming marine campaign Baleares 2013, near Ibiza island.
The main objective is to determine the altimeterbias for Jason-2,about 7:39 UTC September 15, 2013,and Saral/AltiKa, in itsdawn-dusk orbit, about 05:30 UTCSeptember 16.

section	Distance Km	Direct	Reciprocal	AVERAGE	2013 H
					1,70611
175-Bal new	0,703	-0,05437	0,05439	-0,05438	1,20973
Bal new-176 (IBS)	0,673	-0,03448	0,03442	-0,03445	0,55528
176(IBS)-716002	0,089	0,89952	-0,89956	0,89954	1,45482
716002-Placa GPS		9,2617	-9,2619	9,2618	10,7166