JASON-1 Altimeter Calibration Results from the GAVDOS Project

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Abstract

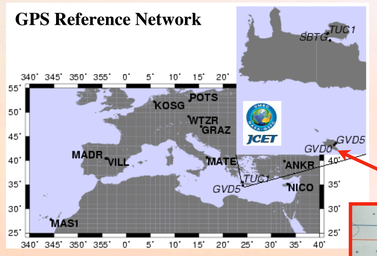
GAVDOS was jointly funded by the EU, NASA and the Swiss Federal Government as an infrastructure research project, intended to fill a recognized gap in the region of South-eastern Mediterranean (Pavlis, 1999). The main objective was the establishment of an absolute sea level monitoring and altimeter calibration facility applicable to many missions. The calibration facility (Mertikas et al., 2003) is under a crossing point of the original ground-tracks of TOPEX/POSEIDON (T/P) which are also the current ones for Jason-1 (passes 018 and 109), and adjacent to an ENVISAT pass. The location of the island Gavdos is about 50 km to the south of the main island of Crete, Greece. The facility hosts in addition to two tide gauges, multiple GPS receivers, a DORIS beacon, a transponder for direct calibration, and is visited periodically by additional systems that collect data to control and validate the operational results. A collocation at the TUC facility site in 2003 with the French transportable laser ranging system (FTLRS) established a link and referenced the entire network of GAVDOS sites in the ITRF2000 frame. The facility has been fully operational since October of 2003, after slow start due to instrumentation failures and facility construction delays. The comparison of tide gauge data collected over that period and until recently (Jason cycles 70 through 90), resulted in a Jason altimeter bias best estimate of 144.7±15 mm, where the quoted standard error is three times the statistical formal error (Pavlis et al., 2004). Future plans of the project include the relocation to the final and originally intended location, on a new pier (finally under construction!), a move that will improve vastly the protection of the facility from heavy winter storms and minimize the need for maintenance. As a result of this move, with minor additions for increased power at the tide gauge site, we will have the ability to obtain regularly via ISDN download the GPS observations on a daily basis. In addition to the altimeter calibration, the project has so far performed two calibration tests for JMR, using WVRs and a GEMOSS instrument. Our plans include now the repeat of these experiments in the near future, and additionally, the utilization of AIRS data for a global calibration of the JMR in general. With regards to this experiment, the first preliminary results indicated a 1-2 mm agreement for cycles 37 and 62, but these were only proof of concept attempts and a lot more cases need to be analyzed before come to any clear conclusions. Finally, the project is starting to produce results on the basis of the IGDRs and we are also extending our efforts to include the ENVISAT and GFO missions.

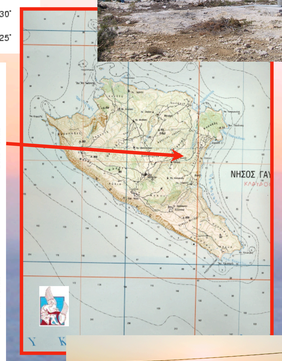
Mertikas, S. P., E. C. Pavlis and P. Drakopoulos. 2003. GAVDOS: A satellite radar altimeter calibration and sea-level monitoring site on the island of Gavdos, Crete, H. Dahlin , N.C. Flemming , K. Nittis, S.E. Petersson eds. *Building the European Capacity in Operational Oceanography*, Proceedings of the 3rd EuroGOOS Conference, 3-6 December 2002, Athens, Greece, pp. 258-264, Elsevier Oceanography Series 69.

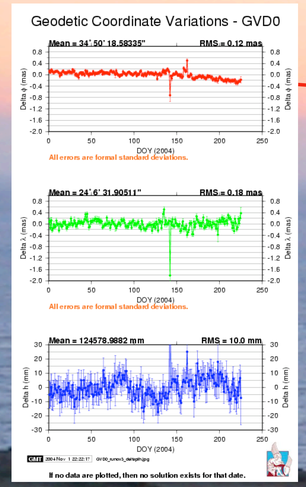
Pavlis, E. C. 1999. Tectonics, Sea-level Monitoring and Altimeter Calibration With a Regional GPS Array, G. Maul ed. *Proc. of the International Symposium on Marine Positioning, INSMAP 98*, Nov. 30 – Dec. 4, 1998, Melbourne, Florida.

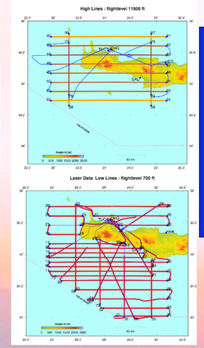
Pavlis, E. C., S. P. Mertikas and the GAVDOS Team. 2004. The GAVDOS Mean Sea Level and Altimeter Calibration Facility: Results for Jason-1, accepted for publication in the 3rd Jason special issue of *Mar. Geod.*.

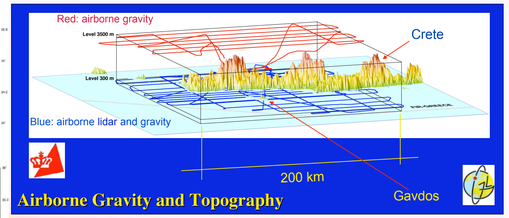
GPS Reference Network



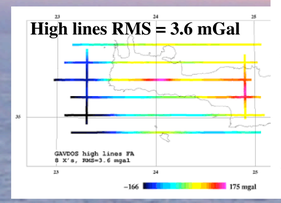


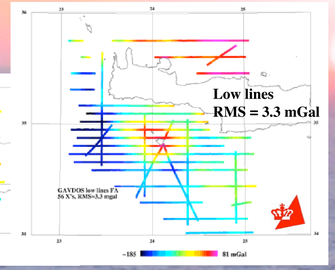




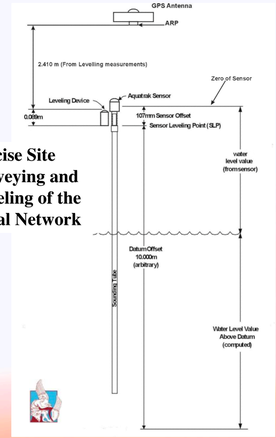


Free-Air Anomaly Cross-over RMS



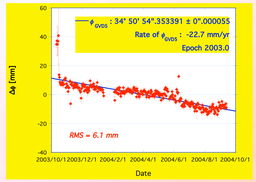


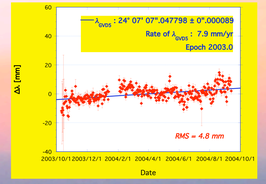
Precise Site Surveying and Leveling of the Local Network

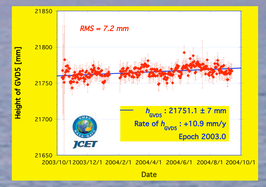


Karave Site

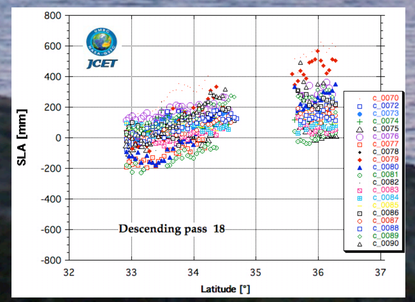
Continuous GPS Monitoring

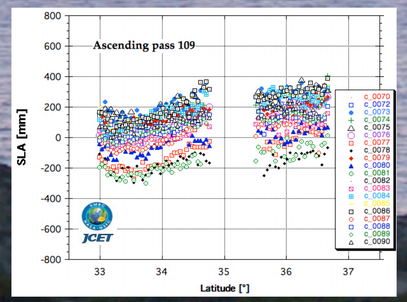




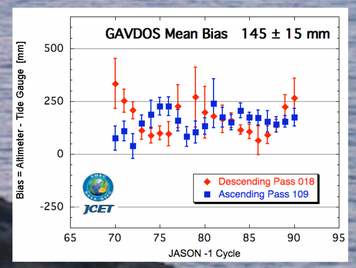


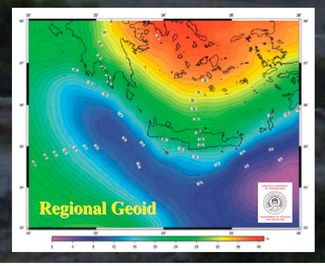
JASON Altimeter SLA from Project GDRs Based on CNES-POE and Labroue 2002 SSB

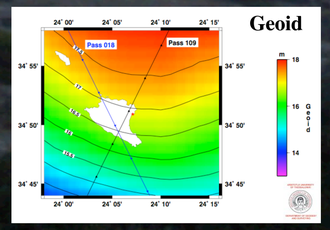


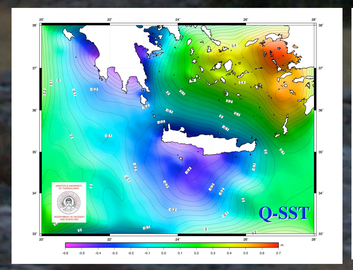


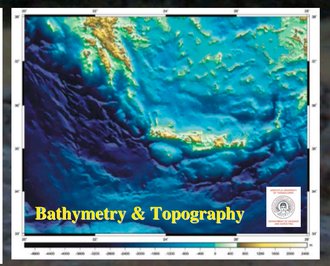
Calibration of Altimeter Bias Twice per Cycle





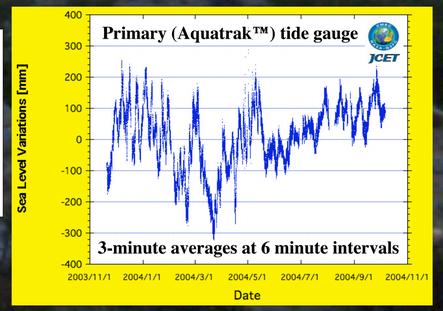




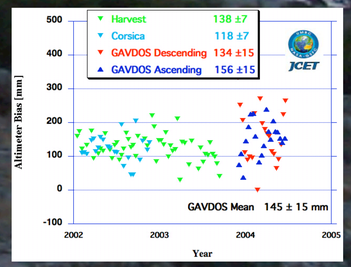


GAVDOS Calibration Site Estimated Error Budget

Component	Systematic	Random
GPS position (Karave)	10 mm	6 mm
Levelling, (TG to GPS antenna)	3 mm	1 mm
JASON altimetry	-	30 mm
Local geoid	10 mm	4 mm
JMR bias	-5 to -10 mm	-
Uncertainty without JMR bias		15 mm
Uncertainty with JMR bias		16-18 mm



Comparisons with Results from other Calibration Sites



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