





A Permanent GPS Array in Crete & the Cal/Val facility for satellite radar altimeters in Gavdos

S. P. Mertikas Technical University f Crete EUREF 2007 Symposium, 6-9 June 2007, London, England

Laboratory of Geodesy and Geomatics Engineering





Ground tracks of Jason-1













Principle of operation









Regional Bathymetry







Equipment locations

GAVDOS EQUIPMENT

Theofilos Permanent Facility

DORIS 3.0 Beacon (Supplied by IGN) **Meteorological station** (Vaisala model PTU 2001 Supplied by IGN) **GPS** Receiver (Leica, Model Rs500, Supplied by TUC) Meteorological station (Aanderaa model AWS2700 Supplied by IMBC) **UHF Link (Connection to Karave)** (SATEL, Model Satelline 3ASd 1watt, Supplied by TUC) **UHF Link (Connection to Crete)** (SATEL, Model Satelline 3ASd Epic, 10 watt, Supplied by TUC) Demultiplexer & Multiplexer Unit (B&B Electronics, Model 232BSS4 Supplied by TUC) Solar Panels (Seimens, Model SM 55, Supplied by TUC) Wind Generator (Air 403) Solar Charger (Steca, Model Tarom 235 Supplied by TUC) **Battery Pack** (Sonnenschein, Supplied by TUC) Container (Dimensions 3x5 m, Supplied by TUC)

Karave Installation

Tide Gauge (Aquatrack, Stevens Vitel VX1080 acoustic, Supplied by JCET/UMBC/NASA) **Backup Tide Gauge** (Aanderaa, pressure Model 0973796 Supplied by IMBC) **GPS** Receiver (Ashtech MicroZ-CGRS, Supplied by JCET) **Doppler Current Meter** (Aanderaa, pressure Model 0973900 Supplied by IMBC) **Deep-sea Current Meter** (Aanderaa, Supplied by IMBC) Data Logger (Stevens Vitel Vx1100, Supplied By JCET/UMBC/NASA) **RS232 Multiplexer Unit** (B&B Electronics, Model 232BSS4 Supplied by TUC) **UHF** Link (SATEL, Model Satelline 3ASd 1watt, Supplied by TUC)



Dias (Crossover Point) Transponder (Supplied by SRISG)





Harbor site in August 2002











Harbour site in April 2005



Ashtech GPS receiver operates
EUMETSAT antenna.
Site sends data to Central Facility,
Pressure tide gauge transmits every 20 minutes,
Acoustic tide gauge transmits every 6 minutes.





New tide gauge with GPS ready









Central permanent site



Normal operation,
DORIS beacon as IDS station
GPS Leica RS500
Weather Station transmits every 20 min







Transponder site *a* cross-over











Communication links



•UHF line is operational.

•GPRS link through Vodafone mobile network and with static IPs ready.

•An ISDN line at Central permanent facility.











EUREF sites







Operations Control Center











Establishment of a European radar altimeter calibration and sea-level monitoring site for JASON, ENVISAT and Euro-GLOSS.

A research project supported by the European Commission's Fifth Framework Programme in the context of "Support for Research Infrastructures" within the Energy, Environment and Sustainable Development Programme, contributing to the implementation of the Key Actions:

2.4 "European component of the global observing systems for climate and oceans" &
3.4 "Operational forecasting of environmental constraints on offshore activities"

Contract No : EVR1-CT-2001-40019 (GAVDOS) Duration : 36 months (1-Dec-2001, 1-Dec-2004) 22 - 23 May 04 TUC team (Achilles, Akis, George and Kiryll) carried out a field trip in Gavdos. Second levelling and data downloads were performed.

28 Apr-5 May 04 Peter Pesec and Walter Hausleitner from SRISG have visited Gavdos to inspect the transponder and make measurements at sea level for Jason and Envisat.

9 Mar 04 New Gavdos site project started.

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Leveling at Gavdos









FTLRS Satellite Laser Ranging









SLR measurements









SLR observations (2003.0)











Geoid map









1'X1' Geoid model











Jan 2003 Airborne Campaign















Airborne campaign











Airborne gravity campaigns







Airborne laser altimetry



BeoMatLab





GPS buoys experiment

















Sea Surface Topography











Absolute bias for Jason-1









Bias comparisons

| Facility | Orbit | Events | Mean ± std. error (mm) | σ (mm) |
|---------------------|----------|------------------|---------------------------|--------|
| Harvest | CNES POE | 31 | +138±7 | 41 |
| Harvest | JPL GPS | 31 | +132±6 | 34 |
| Corsica | CNES POE | 29 | +118±7 | 35 |
| Corsica | JPL GPS | 29 | +124±7 | 36 |
| Bass strait | CNES POE | 47 | +148±6 | 42 |
| Bass strait | JPL GPS | 47 | +131±6 | 40 |
| UK group | CNES POE | 387 [*] | +137±30 | 80 |
| UK group | CNES POE | 610 ⁺ | +143±30 | 71 |
| GAVDOS ¹ | CNES POE | 16 | +134±20 | 80 |
| GAVDOS ² | CNES POE | 41 | +145±15 | 47 |





Jason microwave radiometer calibration



- Comparisons of JMR, GEMOSS (ETHZ, Swiss) and WVR.
- (132.4 ±7.4 mm, 134.0 ±2.0 mm and 138.9 ±5.0 mm).
- Results agree at the level of millimeters.













The new jetty construction















Future west Crete GPS array

KSL1 for Cal/Val

- CHR1 for geodynamics
- SFK1 for geodynamics and silent earthquakes
- RTM1 in the Institute of Mediterranean Studies
- Real-time & post-processed services.









Tectonics & deformation







Hellenic Positioning Service

- 95 permanent GPS stations
- Will provide real-time and post-processed services
- Nationwide & ITRF based
- ADSL connections
- Trimble sets it up in 2007
- Trimble will operate it till 2008
- Hellenic Mapping & Cadastral Organization.









Future plans

- Continue monitoring satellite altimetry for calibration/Validation.
- Transmit reliably, securely and immediately Cal/Val data.
- Transmit GPS data to ASI (Italy) & BKGE (Germany), OLG (Austria).
- Develop procedures for automatic analysis and archiving of data.
- Extent capabilities to Geosat-Follow-On, Cryosat-2, Jason-2: Ocean Surface Topography Mission, etc.
- Officially engage Gavdos to IGS, Med-GLOSS, ESEAS, Poseidon, etc.

