



The Eastern Mediterranean Altimeter Calibration Network -

eMACnet:

Anticipating JASON-3 and SWOT

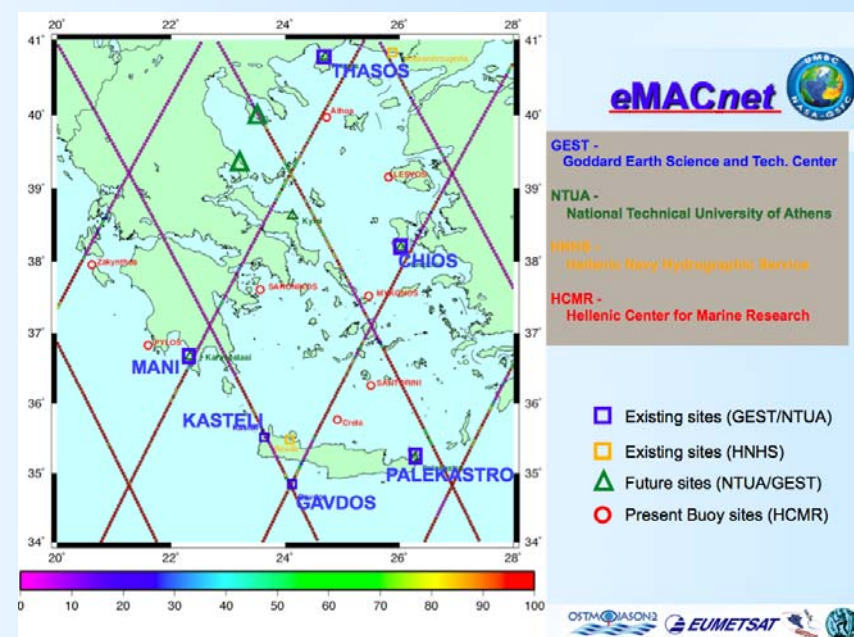
Erricos C. Pavlis

and

the eMACnet Team

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NASA Goddard Space Flight Center 698

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Ocean Surface Topography
Science Team Meeting
Lisbon, Portugal
October 18-20, 2010



Outline



- **e-MACnet Team Members**
- **Current state of the sensor network**
 - System relocations
 - New deployments
 - Calibration results
- **Near real-time data delivery capability (support for EMTWS)**
- **Network densification in anticipation of future missions' requirements**
- **Outlook**





Consortium News



- Consortium comprises of the following groups:
 - Goddard Earth Science and Technology Center (GEST)
 - The National Technical University of Athens (NTUA)
 - The Hellenic Navy Hydrographic Service (HNHS)
 - *The Hellenic Center for Marine Research (HCMR)*



Current Network (e-MACnet)



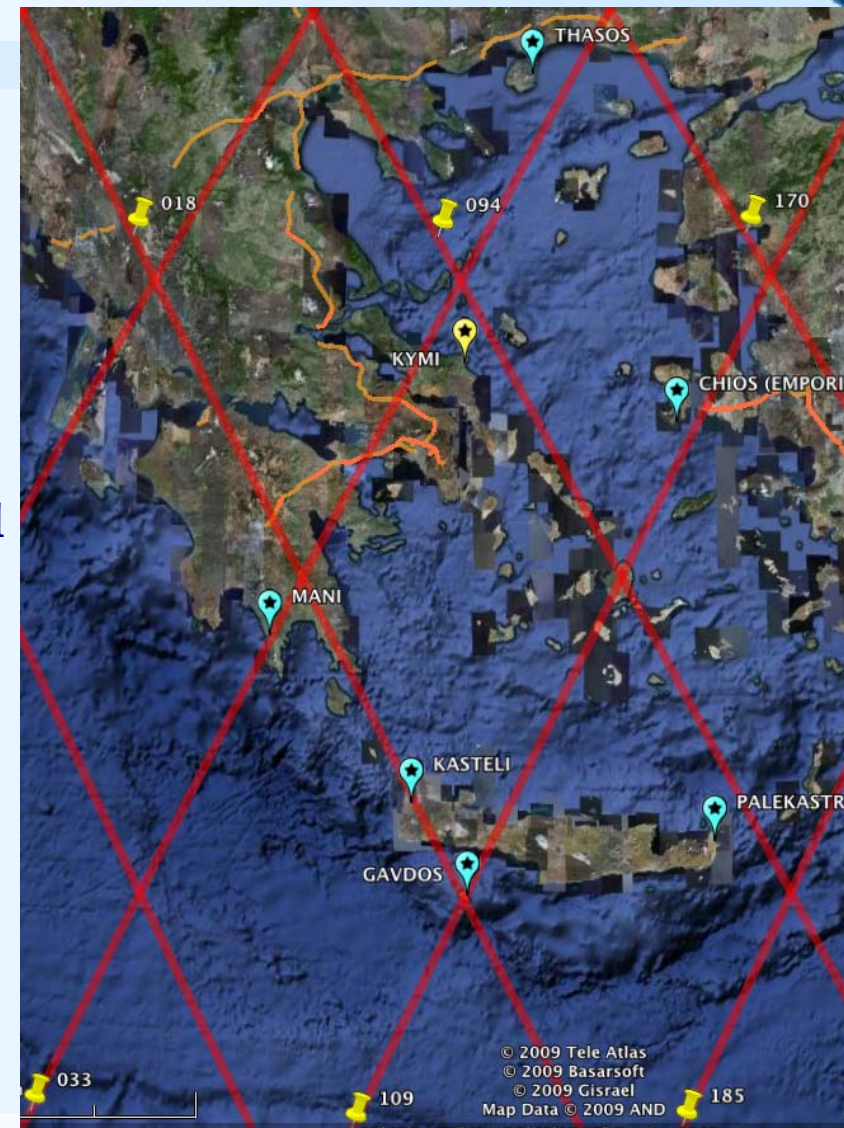
- **Operational Sites:**
 - GAVDOS, Crete (GEST), relocated as of October 2010
 - KASTELI (2), Crete (GEST & NTUA), online on IOC's GTS
 - PALEKASTRO, TG + GNSS receiver (NTUA)
 - CHIOS (NTUA)
 - MANI (NTUA)
 - THASOS (NTUA)
- **Buoy sites (NTUA+GEST+HCMR):**
 - New proposal submitted for GNSS & OBP addition to 1-2 existing HCMR buoys (2011)



The eMACnet Network

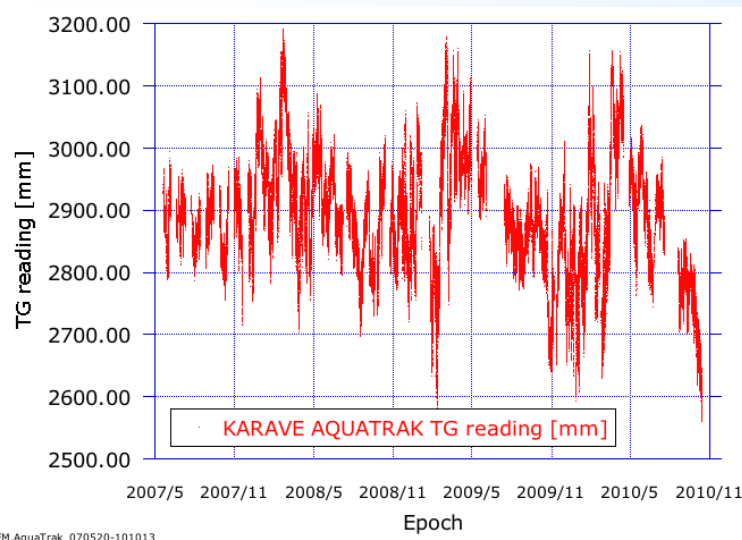


- Six operational sites, one with two tide gauges (VegaPuls 61 Radar and OTT float)
- Three sites with CORS GNSS receivers
- Two more GNSS receivers purchased for installation at CHIOS & MANI (2010)
- THASOS and a new site in central north Greece will be equipped with GNSS receivers in early 2011
- Tracks covered: 18, 33, 94, 109 (185)

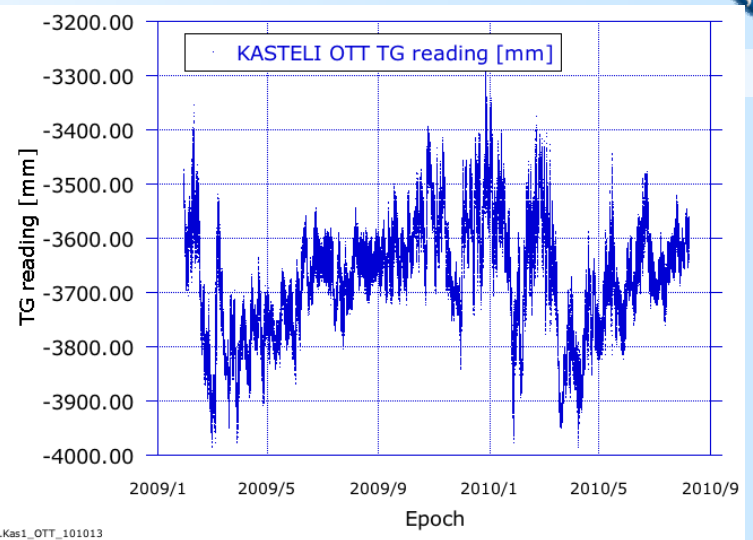




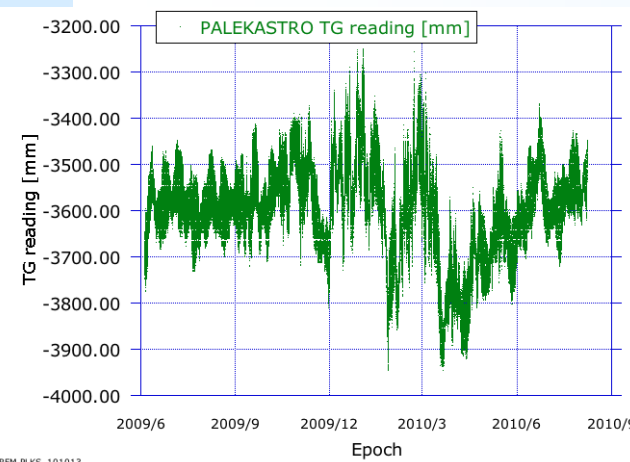
Tide Gauge Series



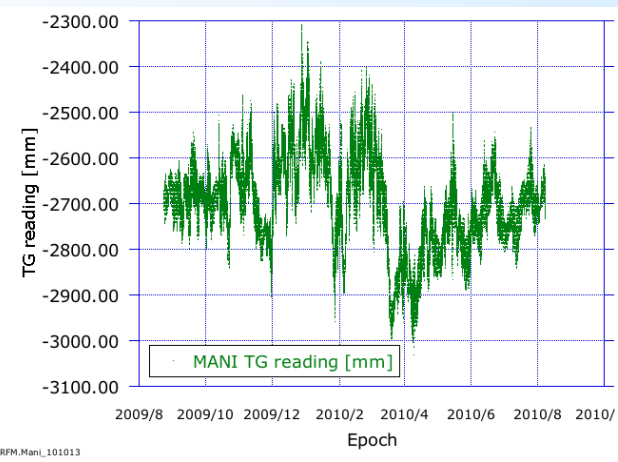
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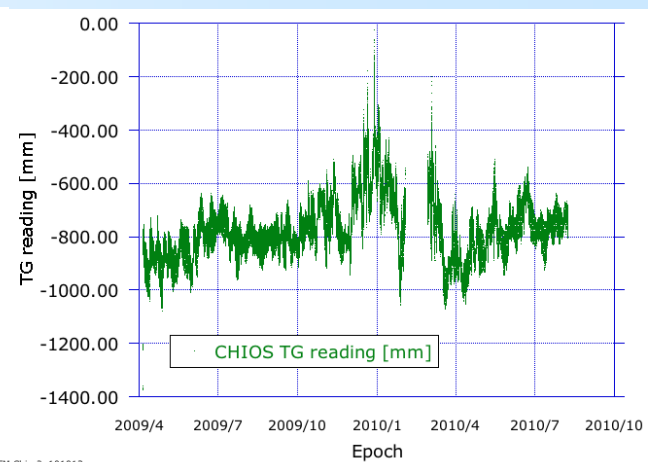
RFM.Kas1_OTT_101013



RFM.PLKS_101013



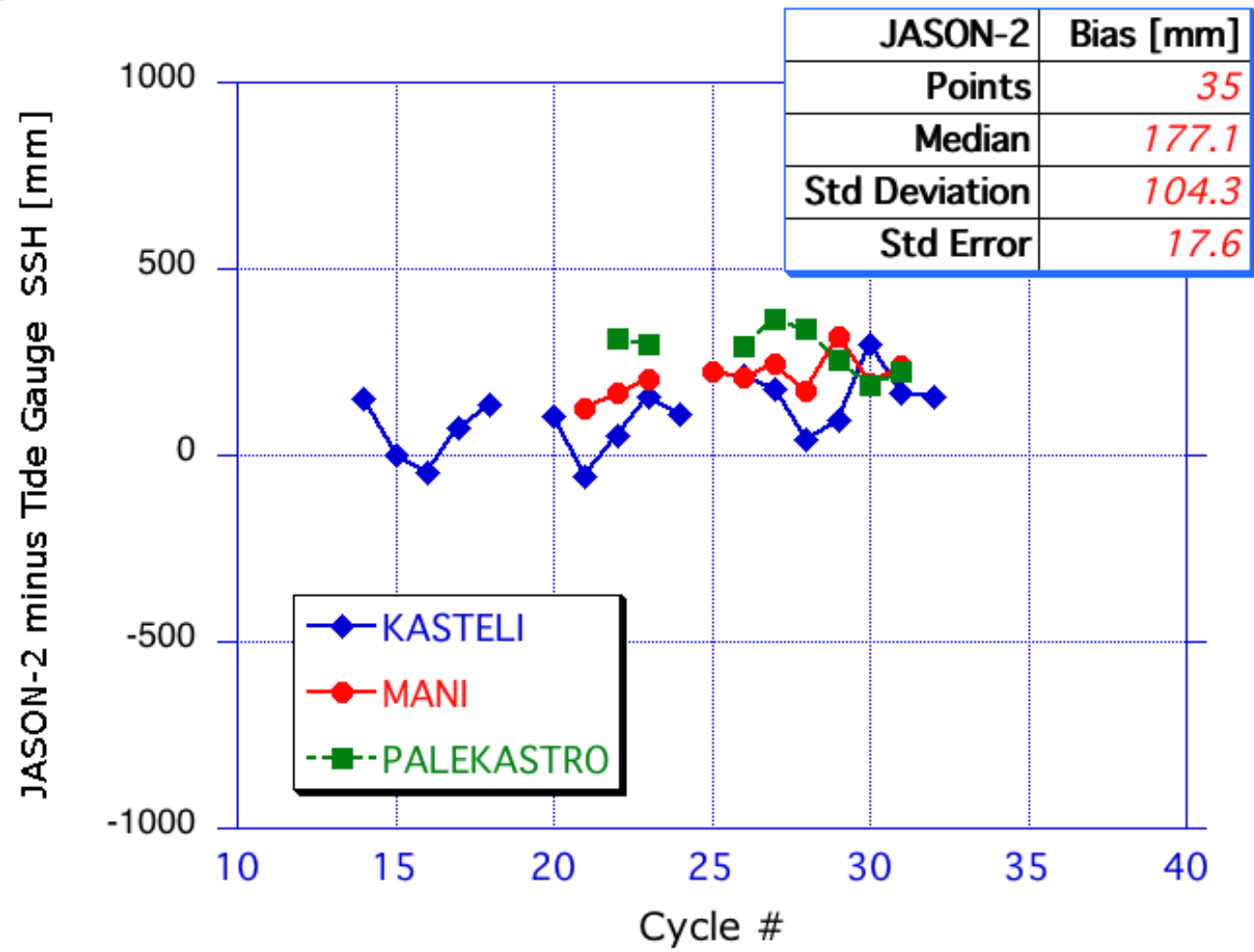
RFM.Man_101013



RFM.Chios2_101013



JASON - 2 Calibrated Bias



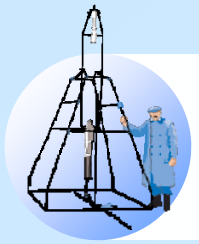


GAVDOS Site Relocation

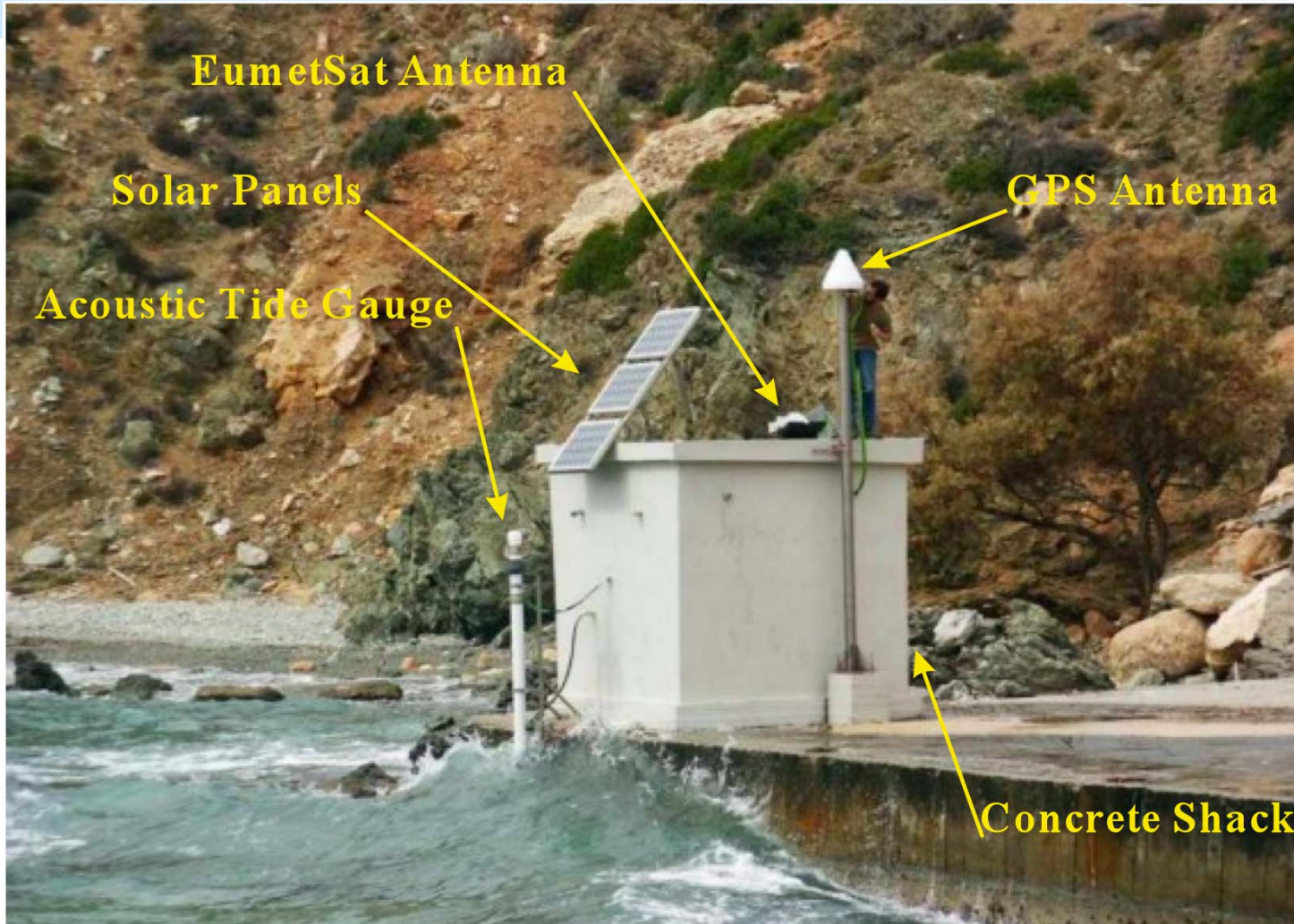


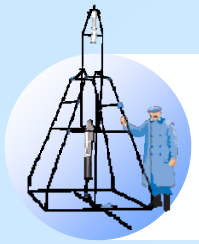
- The AQUATRAK tide gauge (operational since 2003) was relocated to the initially intended location after completion of the HNHS instrument shack on the new KARAVE harbor (east of old location)
- A new CORS GNSS receiver installed and operational at the new location, along with the MET3A sensor and communications equipment for local and satellite transmission of data
- New leveling between old and new sites and GPS data reduction will provide tie to the old record (end of 2010)





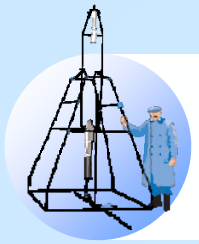
Old GAVDOS AQUATRAK Site





New GAVDOS AQUATRAK Site



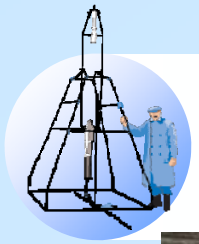


New GAVDOS AQUATRAK Site



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New GAVDOS AQUATRAK Site



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KASTELI site



SEA LEVEL STATION MONITORING FACILITY

Intro Map Stations Database Metadata

Previous station Station **Kasteli** at 2010-10-15 18:12 GMT Next station

[more details] [GTS message] [show data] [show on map] [monitor]

Station metadata	
Code	kast
Country	Greece
Location	Kasteli
Status	Operational
Local Contact	National Technical University of Athens (Greece)
Other Contact	Goddard Earth Science and Technology Center, University of Maryland, Baltimore County (USA)
Latitude	35.514
Longitude	23.637
Connection	GTS message
Sensor 1	
Type of sensor	rad
Sampling rate (min)	1

Sealevel at Kasteli station - (3.069 m)

From 2010-09-15 18:12 to 2010-10-15 18:12 @IOC-VLIZ

- use left icons to zoom & scroll
- Relative levels= signal - average over selected period [shown]
- Absolute levels= as received

EUMETSAT transmission antenna

Every 15 min transmits the past 30 min of data



KASTELI data are placed online via GTS and can be viewed through IOC's web site



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Remote control and data access

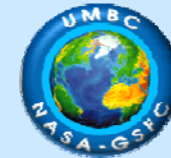


- Substantial effort over the past year on the automation of data collection, both for tide gauge and GNSS data
- All float tide gauges are connected via mobile phone lines and modems to a central server at NTUA
- The server executes weekly (or whenever desired) a routine that dials each sensor and downloads the data to the server (it also aligns the sensor clock to its own)
- The GNSS receivers we now deploy are online via mobile network communication lines and can be accessed from anywhere via a browser to control, download, reset, etc.





GNSS control and data access



Instrument ID:	PLKS	Uptime:	1 day 04:43 h	Sat.visible GPS:	10	Logging:	On	14:31:41 2009-08-19
Sensor type:	GRX1200 GG Pro	Memory:	28% (274 MB)	Sat.tracked L1 GPS:	10	RTK:	Off	
IP address:	192.168.0.3	Power:	85%	Sat.tracked L2 GPS:	10	Ring buffer:	On	

Home Status Configuration Help



Instrument ID:	PLKS	Uptime:	1 day 07:42 h	Sat.visible GPS:	7	Logging:	On
Sensor type:	GRX1200 GG Pro	Memory:	28% (273 MB)	Sat.tracked L1 GPS:	7	RTK:	Off
IP address:							



Instrument ID:	PLKS	Uptime:	1 day 07:43 h	Sat.visible GPS:	7	Logging:	On	17:31:24 2009-08-19
Sensor type:	GRX1200 GG Pro	Memory:	28% (273 MB)	Sat.tracked L1 GPS:	7	RTK:	Off	
IP address:	192.168.0.3	Power:	85%	Sat.tracked L2 GPS:	7	Ring buffer:	On	

Status

- System Information
- Power & Memory
- Position
- Satellites
- Logging
- Antenna
- Message Log
- Interfaces
- Ethernet
- CF Card (via FTP)

GRX1200 GG Pro

Home Status Configuration Help Support

Status

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Position

Local time:
Position latitude:
Longitude:
Ellipsoidal height:
X:
Y:
Z:
HDOP:
VDOP:
GDOP:
PDOP:
Position quality:
Height quality:

Status
System Information
Power & Memory
Position
Satellites
Logging
Antenna
Message Log
Interfaces
Ethernet
CF Card (via FTP)

Satellites

Almanac	
Date of GPS almanac:	2009/08/21 19:56:48

Sat	Elevation	Azimuth	GPS		Health	URA	IODE
			S/N1	S/N2			
G21	84	316	51	51	OK	2.0	17
G29	49	66	51	(48)	OK	2.0	22
G24	46	44	50	46	OK	2.8	71
G16	37	315	49	43	OK	2.0	53
G18	34	160	48	40	OK	2.0	17
G31	26	242	48	(45)	OK	2.0	51
G30	26	150	47	39	OK	2.0	103
G22	10	186	--	--	OK	--	--
G10	10	39	--	--	OK	--	--
G06	10	290	--	--	OK	--	--
G12	0	144	--	--	OK	--	--
G15	-3	93	--	--	OK	--	--
G03	-3	289	--	--	OK	--	--
G25	-10	344	--	--	OK	--	--
G26	-14	172	--	--	OK	--	--
G13	-14	337	--	--	OK	--	--
G14	-17	198	--	--	OK	--	--

Health	
OK	G2, G3, G4, G6, G7, G8, G9, G10, G11, G12, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22, G23, G24, G25, G26, G27, G28, G29, G30, G31, G32
Bad	G1
Not available	G5



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Online Data Base Development







- **Developed a relational data base for the GDR releases used by e-MACnet**
- **Allows easy computation of various quantities (e.g. SLAs) with multiple inputs for the various corrections**
- **Currently we are updating the J-1 part with the recently released enhanced JMR product**
- **Once complete, the d-base will be put online and it will be routinely maintained**

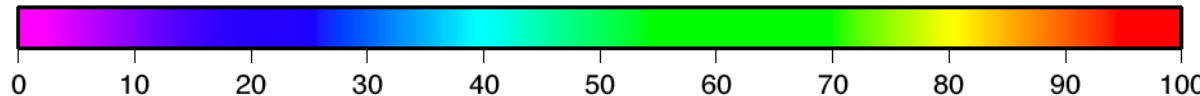
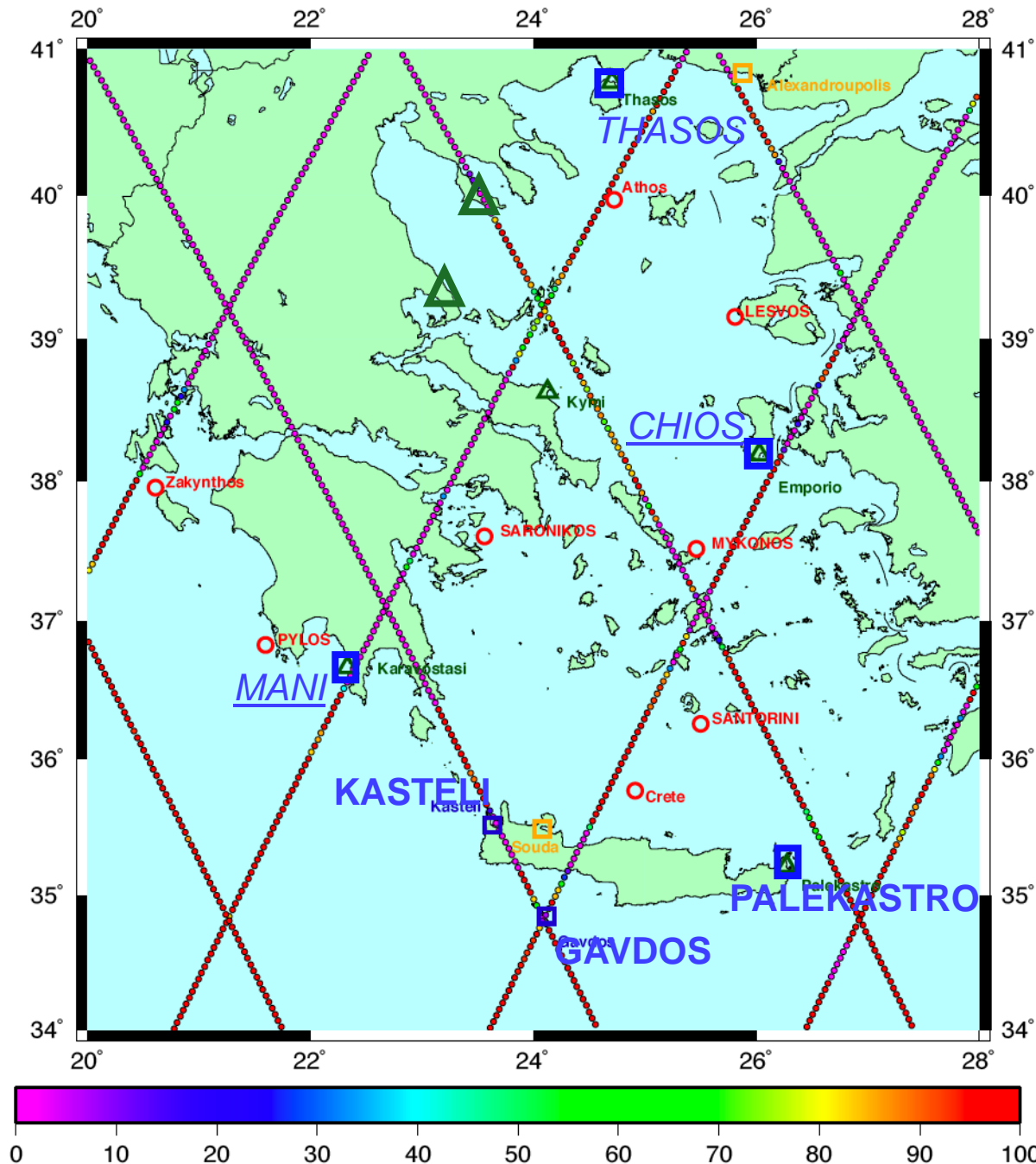


eMACnet



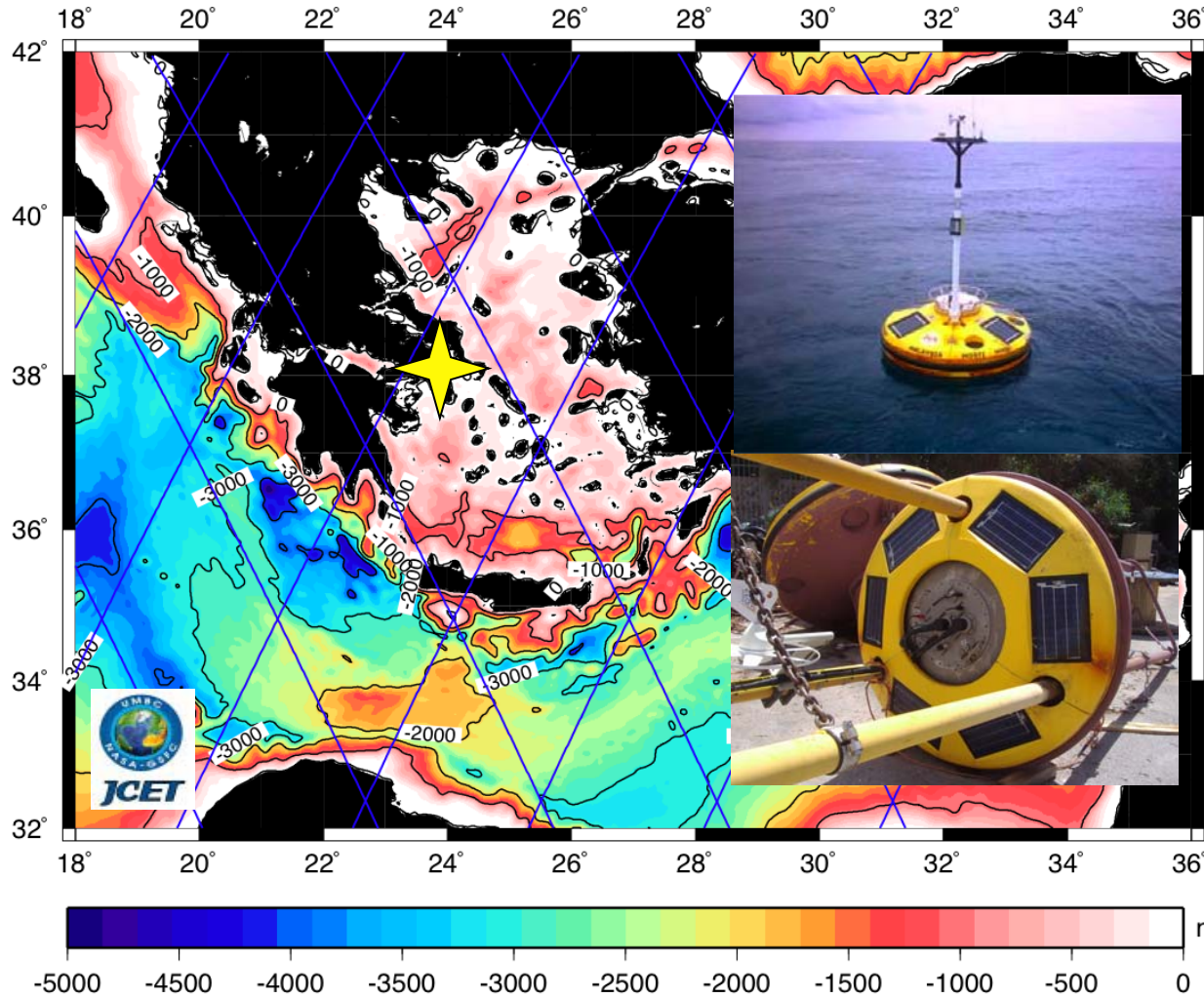
- GEST -**
Goddard Earth Science and Tech. Center
- NTUA -**
National Technical University of Athens
- HNHS -**
Hellenic Navy Hydrographic Service
- HCMR -**
Hellenic Center for Marine Research

-  Existing sites (GEST/NTUA)
-  Existing sites (HNHS)
-  Future sites (NTUA/GEST)
-  Present Buoy sites (HCMR, no precise positioning yet!)

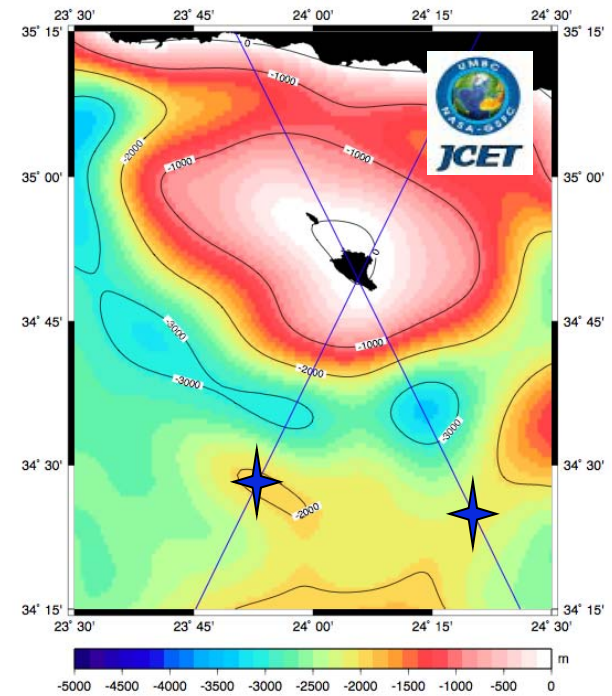




Proposed Buoy Location (pending)



Bathymetry around Gavdos



Possible buoy locations ✦



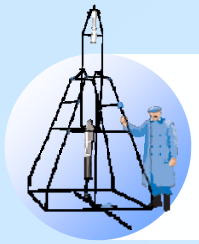
Future Plans / Outlook



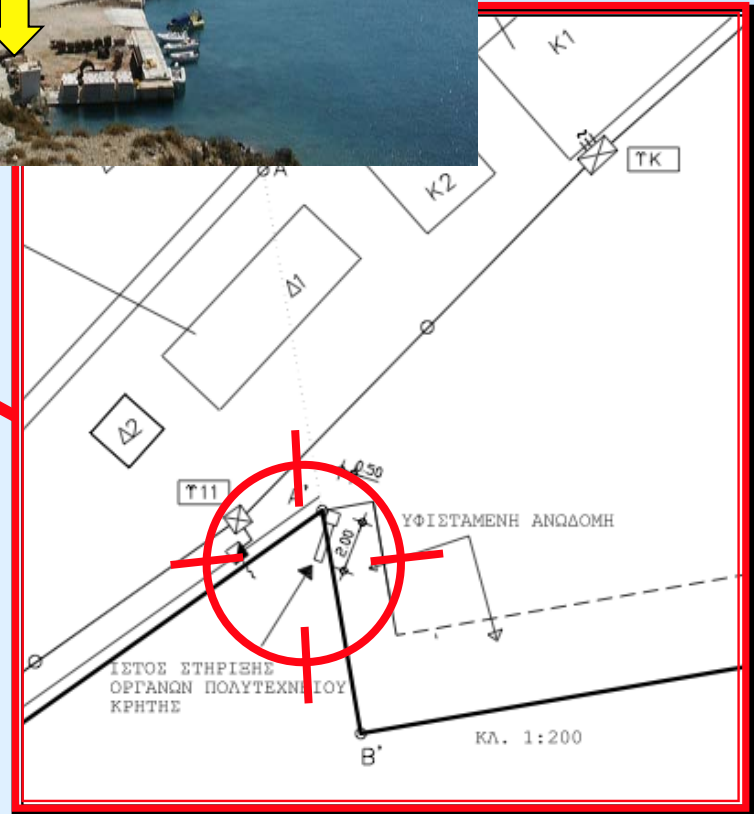
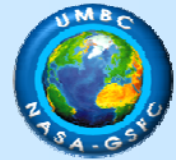
- **Connect new KARAVE to EUMETCAST and enable data collection with 15 min latency**
- **Complete GNSS installations at CHIOS and MANI in 2010, and THASOS by early 2011 (GEST & NTUA have purchased instruments)**
- **Re-analysis of GPS data with ITRF2008 back to 2003**
- **Redo /extend calibration series with new GDRs for JASON 1 & 2**
- **Pursue redeployment of mobile SLR (FTLRS?) at Dionysos satellite tracking station (NTUA) in the next 1-2 years (will cover all tracks!!!)**

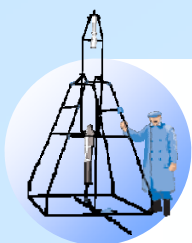


THANK YOU !



Final KARAVE location (HNHS)





JASON-1 Calibration (GDR-C)



Coordinates for GVD5 based on ITRF2005 (1 year of data)

ITRF2005 Orbits (GSFC, Luthcke et al.)

JMR corrections (Desai model)

New Parametric SSB (ITRF2005-compatible)

Revised Gavdos GVD5 Height: **21.7805 m**

Previous Gavdos GVD5 Height: **21.7620 m**

Δh Correction to previous Bias : **-0.0185 m**

Δh Correction due to TRF change: **0.0246 m**

Correction due to Seasonal ΔSLA : **-0.0080 m**

Δh due to ΔGDR from v.B to v.C (cycle dependent)

REVISED JASON-1 BIAS: **107.5 \pm 8 mm**