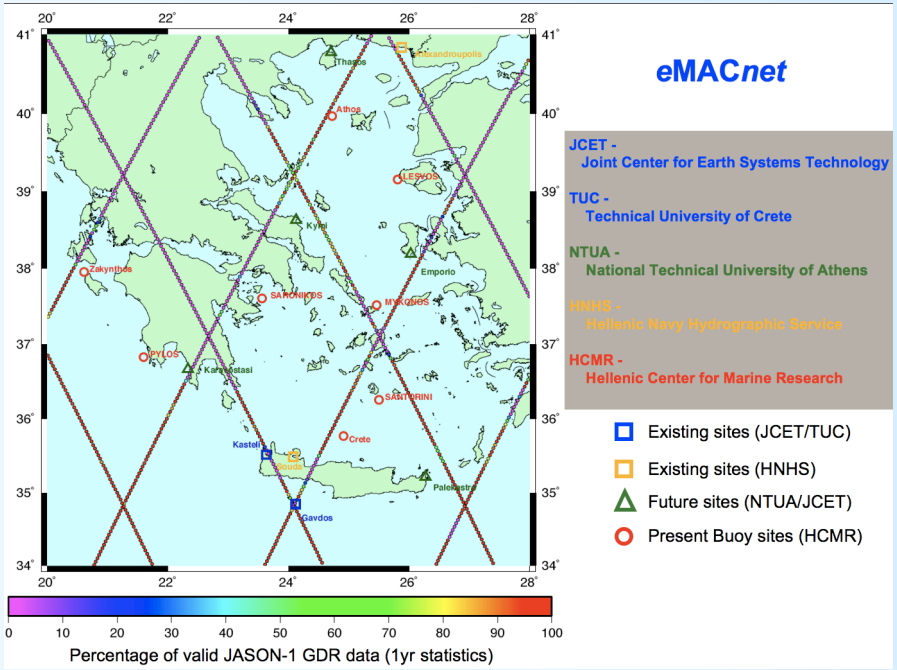
Eastern Mediterranean Altimeter Calibration Network – eMAC*net*

Erricos C. Pavlis[1], K. Evans[1], P. Milas[2], B. A. Massinas[2], and D. Paradissis[2]

[1)]Goddard Earth Science and Technology Center and NASA Goddard Space Flight Center
epavlis@umbc.edu

[2)]National Technical University of Athens, Greece



ILRS Technical Workshop on
SLR Tracking of GNSS Constellations
Metsovo, Greece,
September 14-19, 2009

Introduction

- Global and regional sea level monitoring is very important within the global change program
- Altimeters provide global snapshots over 10-day intervals
- Limited lifetime of such missions requires to ensure the continuity of such time series over decades and across missions
- Absolute “calibration/validation” (Cal/Val) sites provide in situ measurements that facilitate this process
- Few such sites globally:
  - Harvest Platform, CA, USA
  - Corsica, France,
  - Bass Strait, Tasmania, Australia
  - Aegean network / GAVDOS, Greece
- eMACnet is the outgrowth of the GAVDOS project

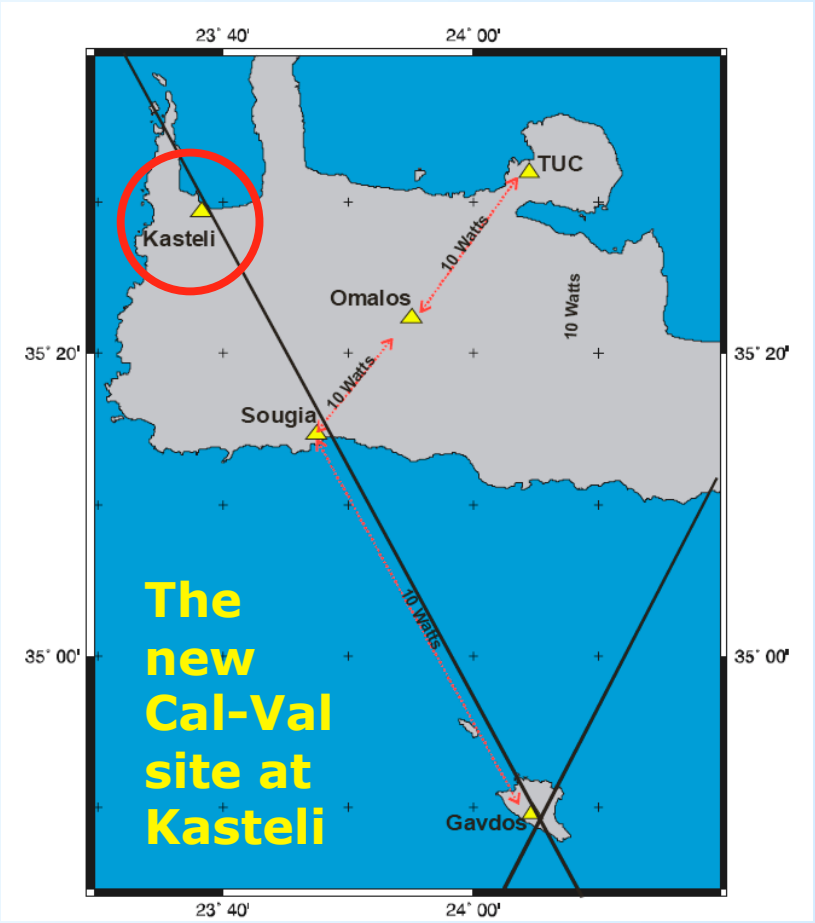
SLR and GNSS Role in Cal/Val

- The success of accurate seal level monitoring relies heavily on both techniques, SLR and GNSS:
  - Both techniques contribute to POD of the altimeter mission
  - Regional SLR tracking provides control of the orbit over the Cal/Val sites
  - GNSS provides the accurate coordinates of the tide gauge site, monitoring tectonic motion contamination
- Optimally, we would like to have:
  - high-accuracy, ITRF-compatible GNSS orbits, to facilitate the tide gauge point-positioning at the time of the altimeter overpass
  - Consistent GNSS orbits across time to avoid any biasing of the results and introduction of false trends

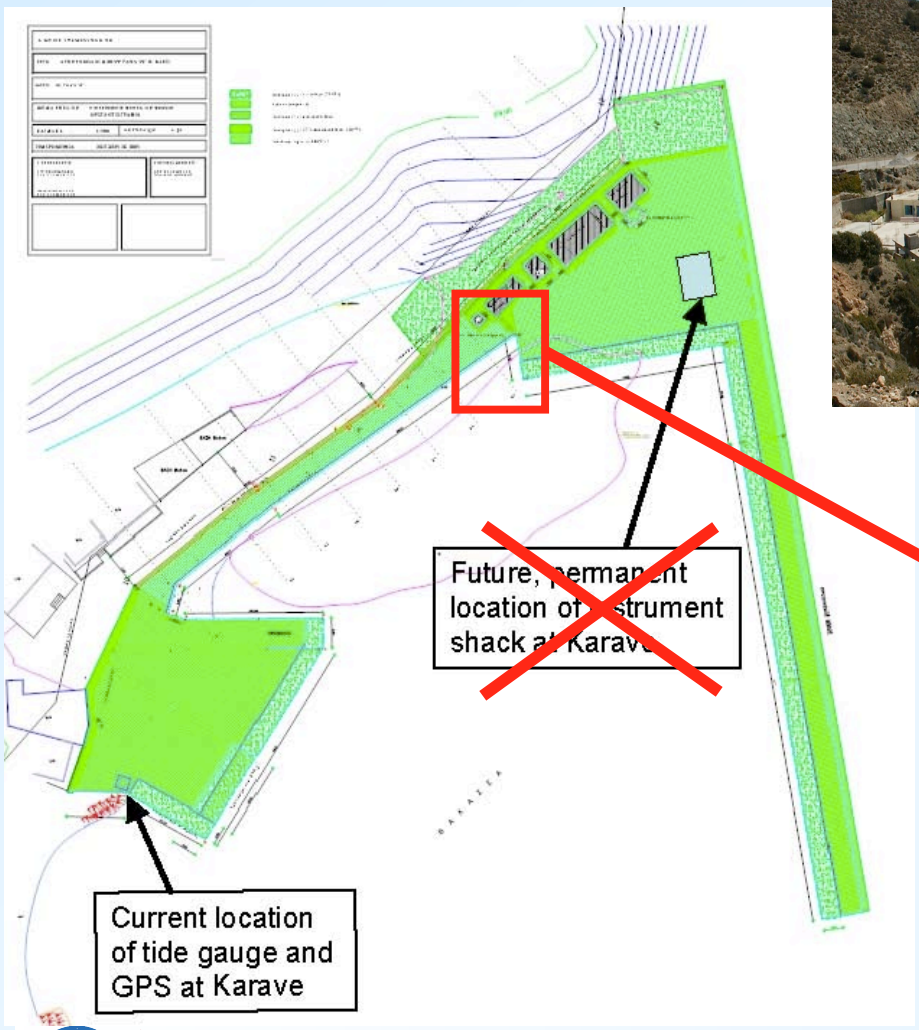
Pre-existing Network Status

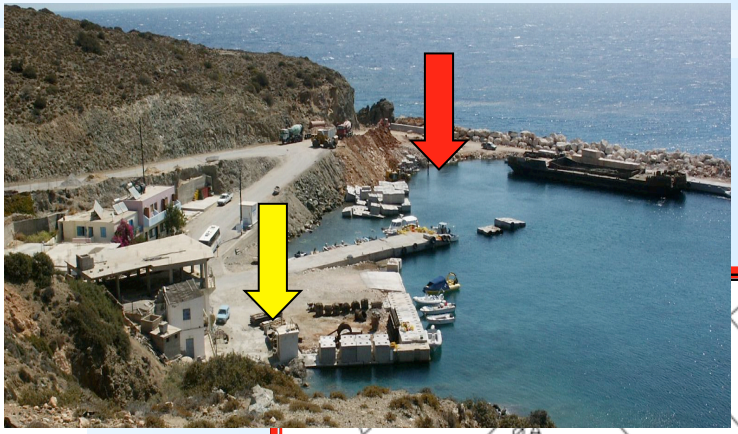
- **Operations**
  - **With the completion of the new port and jetty the main site KARAVE will move within 2009 to its final location with GPRS modem data access**

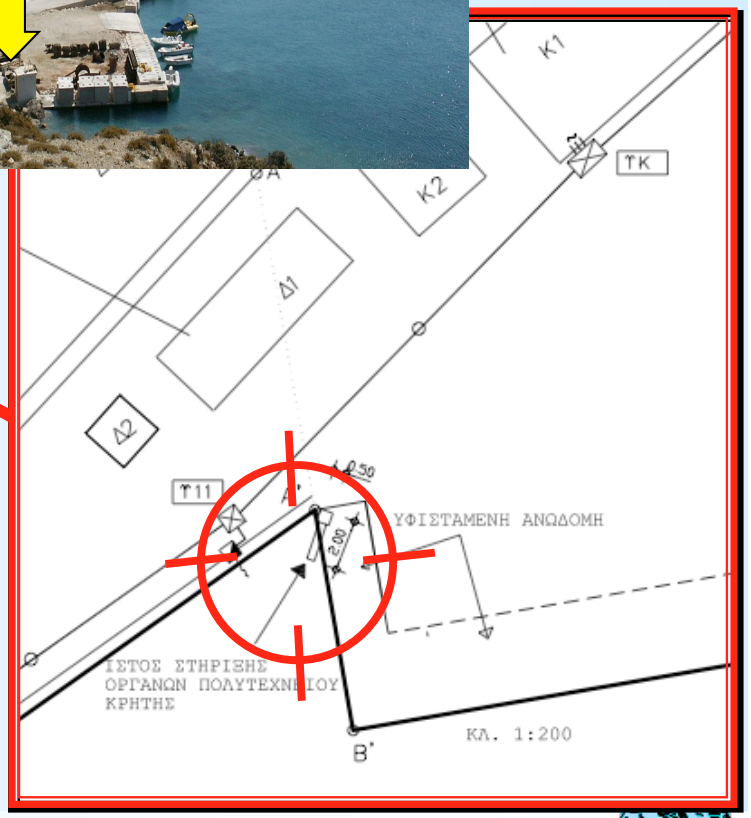
- **Installations**
  - **New site at KASTELI:**
    - **GPS (*Leica* GRX1200Pro GG)**
    - **RADAR *TG (VegaPuls61)***
    - **MET3 *(Paroscientific)***
    - ***GPRS data link***
    - **Float TG (OTT)**



KARAVE relocation (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**

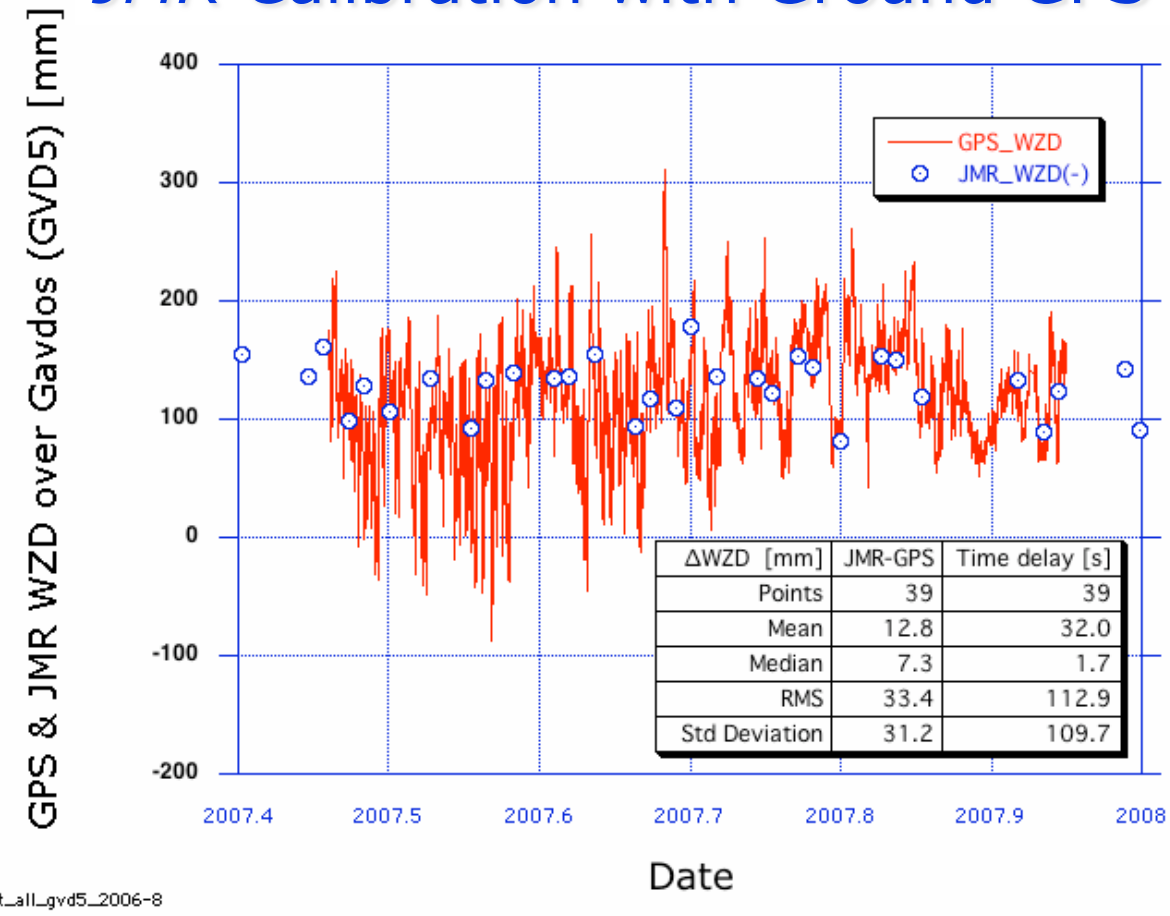
Correction due to Seasonal ΔSLA: **-0.0080 m**

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

REVISED JASON-1 BIAS: **107.5 ± 8 mm**

JASON-1 Calibration (GDR-C)

JMR Calibration with Ground GPS



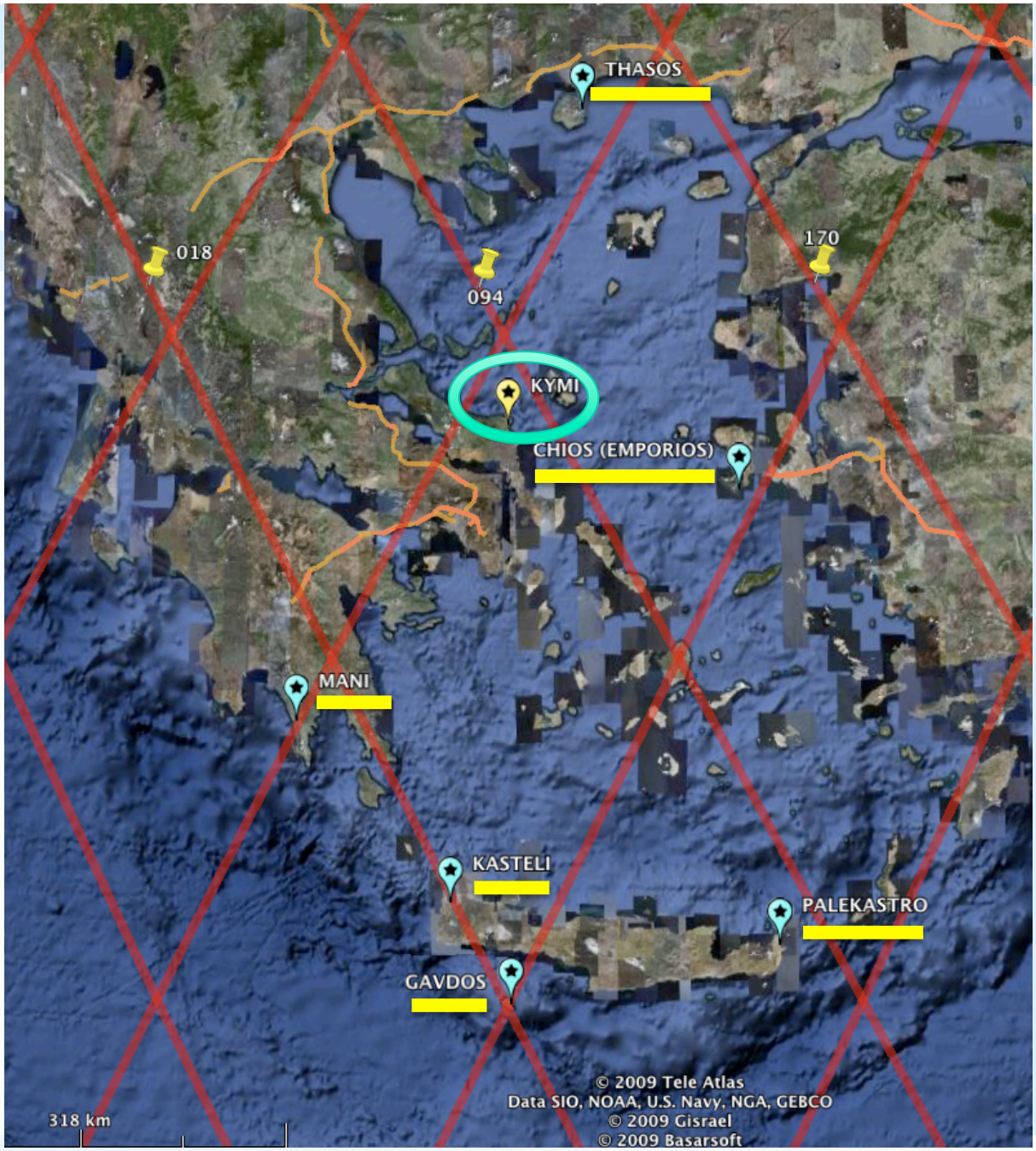
Comparison of GPS-derived WZD at GVD5 (30 min averages) with JMR values obtained from GDR-C release.

Comparison point is closest to the GVD5 location.

Time delay provides a measure of how close in time were the two measurements made.

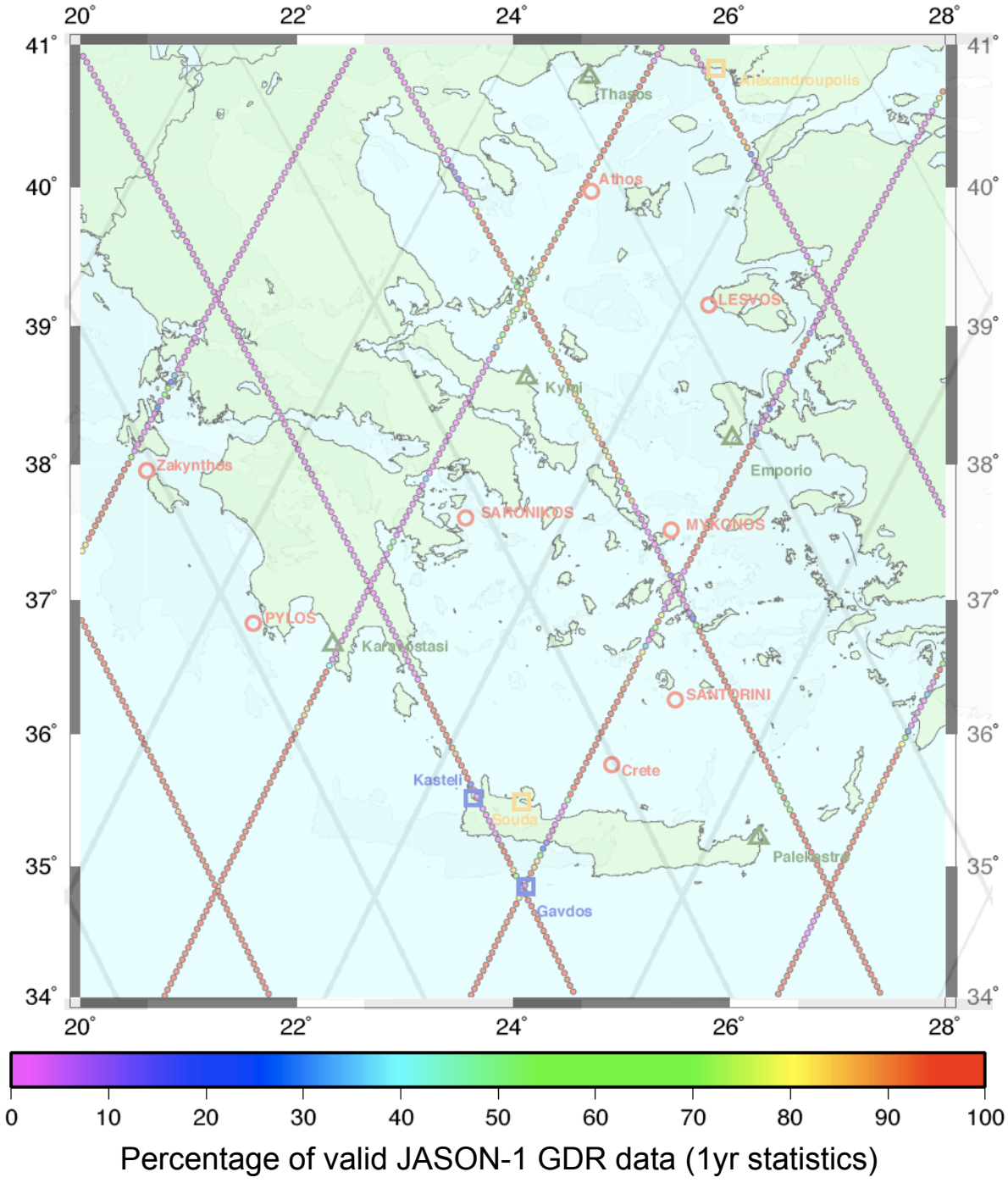
eMAC*net* Consortium News

- **Consortium expanded to include three new groups:**
  - **The National Technical University of Athens (NTUA)**
  - **The Hellenic Navy Hydrographic Service (HNHS)**
- **New installations ongoing and planned:**
  - **KARAVOSTASI, S. Peloponnese (NTUA, operational)**
  - **KASTELI Back-up float TG (NTUA, operational)**
  - **PALEKASTRO, Crete, TG + GNSS receiver (NTUA, operational)**
  - **THASOS site, N. Aegean (NTUA, operational)**
  - **EMPORIO (Chios) site, N. Aegean (NTUA, operational)**
  - ***TBD*, KYMI (Evia) area site, TG + GNSS receiver (late 2009)**



OSTM/JASON-2

eMACnet



eMACnet

OSTM/JASON-2

JCET -
Joint Center for Earth Systems Technology

TUC -
Technical University of Crete

NTUA -
National Technical University of Athens

HNHS -
Hellenic Navy Hydrographic Service

HCMR -
Hellenic Center for Marine Research

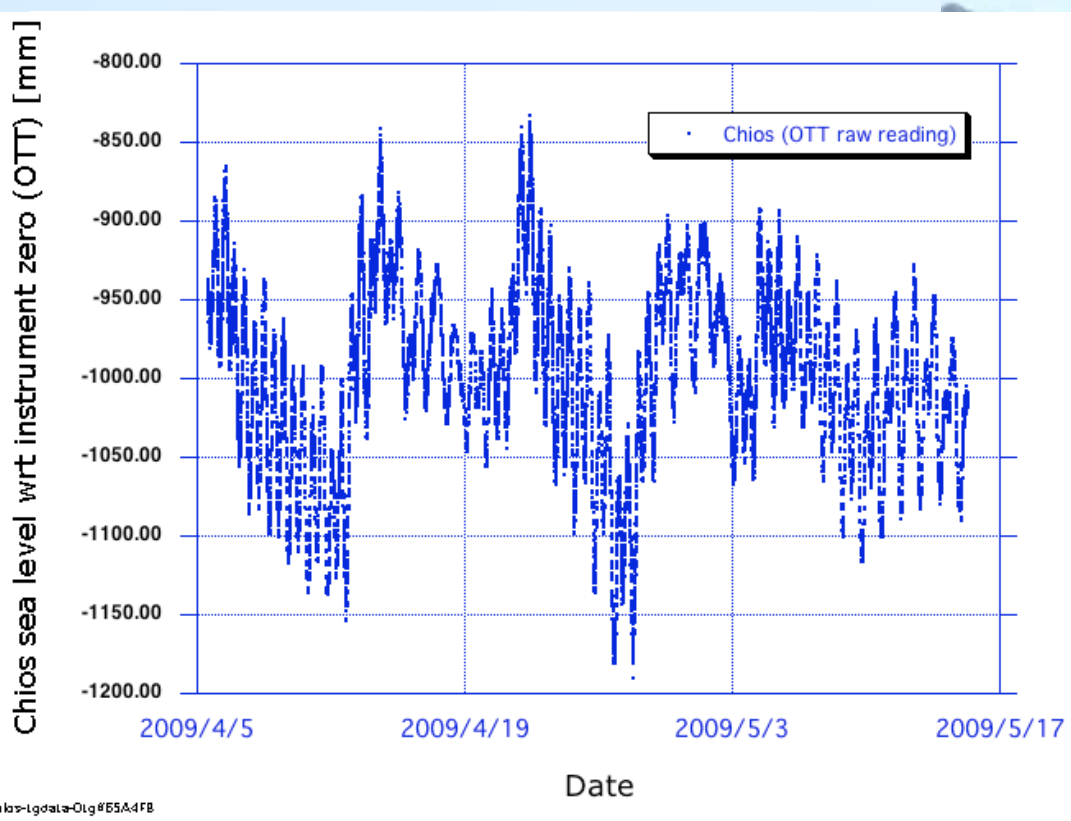
- Existing sites (JCET/TUC)
- Existing sites (HNHS)
- Future sites (NTUA/JCET)
- Present Buoy sites (HCMR)

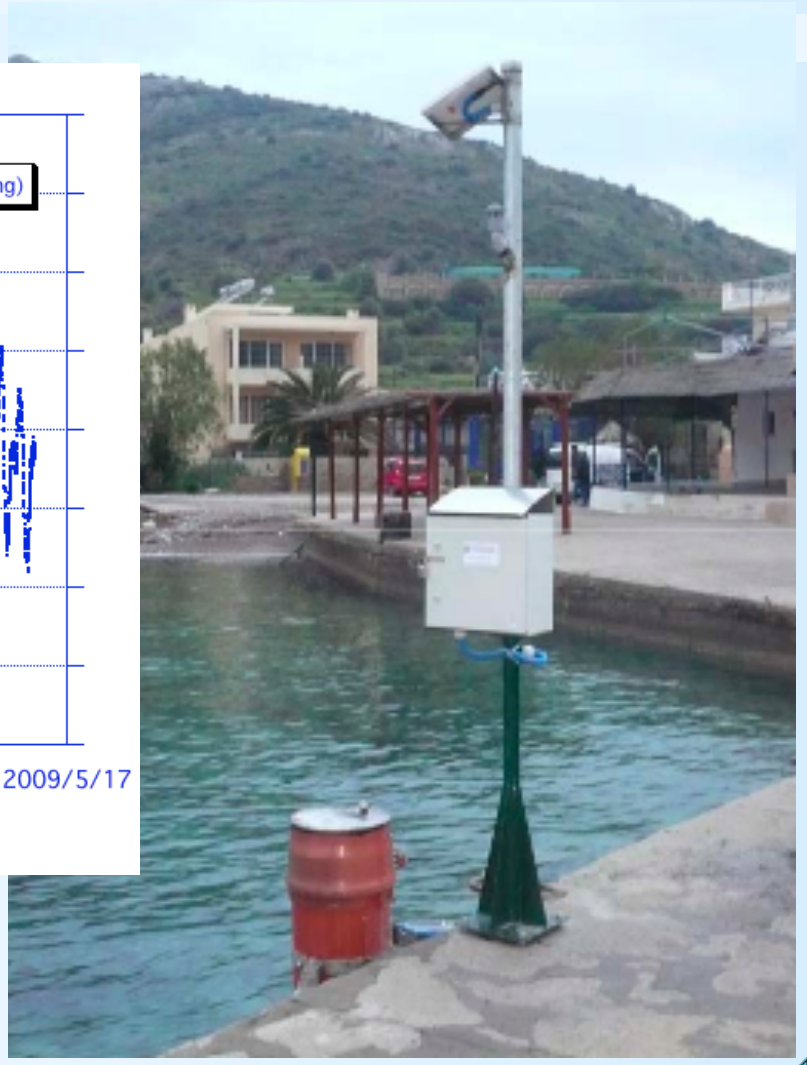
KASTELI site

PALEKASTRO site

THASOS site

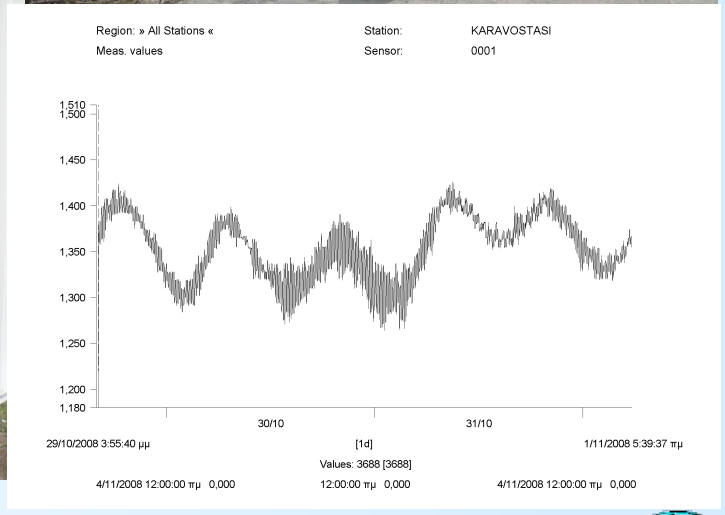
EMPORIO (Chios) site



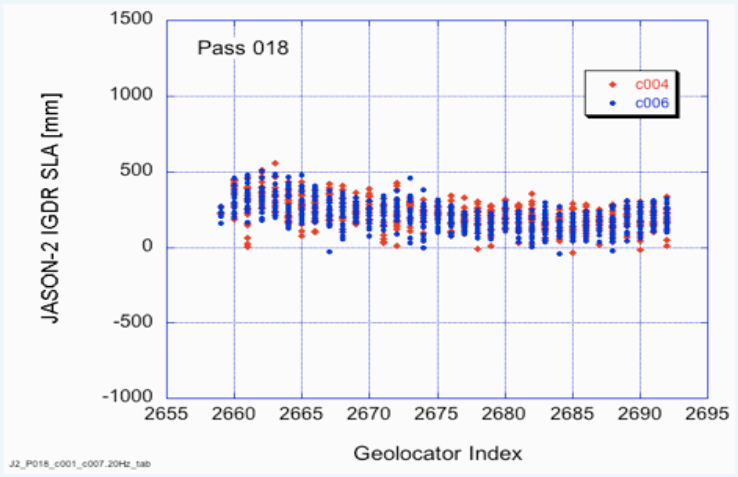


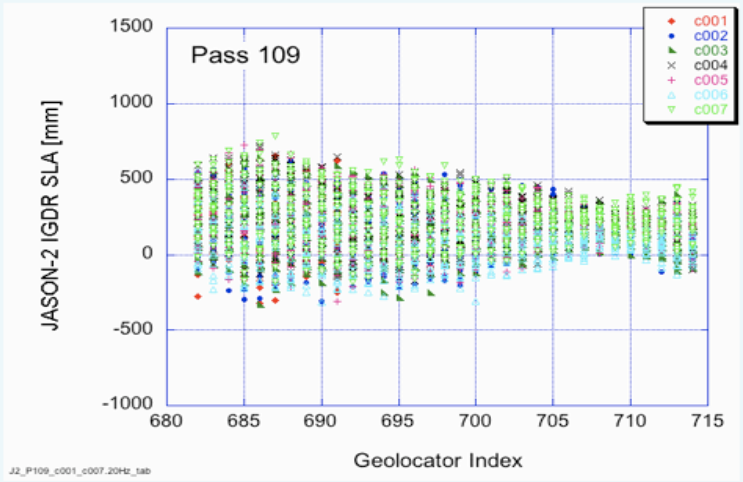
KARAVOSTASI site

- **KARAVOSTASI installation**
  - **New (NTUA) site in south Peloponnese**
    - *GPRS data link*
    - *Float TG (OTT)*



JASON-2 Gavdos Calibration (1 - 9)





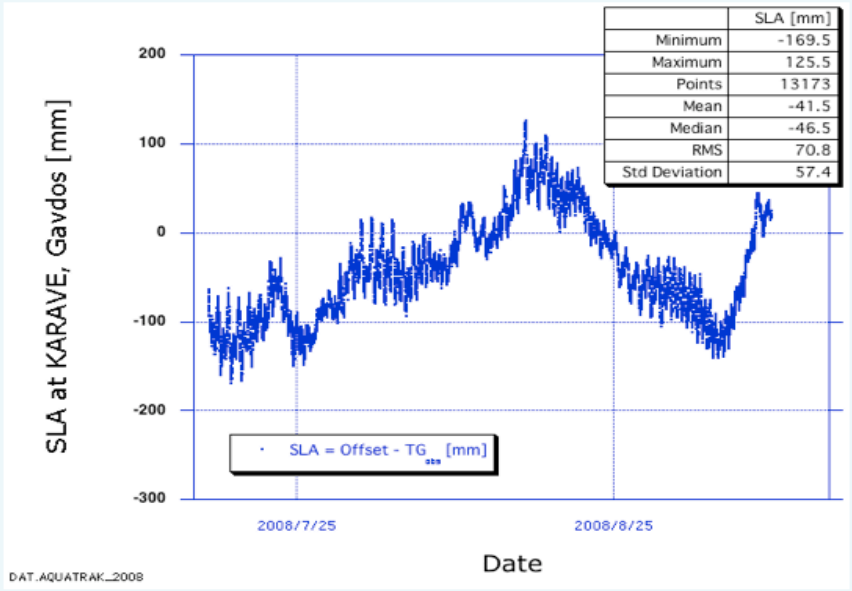
Preliminary Bias Results for JASON-2

Pass 018: 2 cycles 258.0 ± 10 (formal)

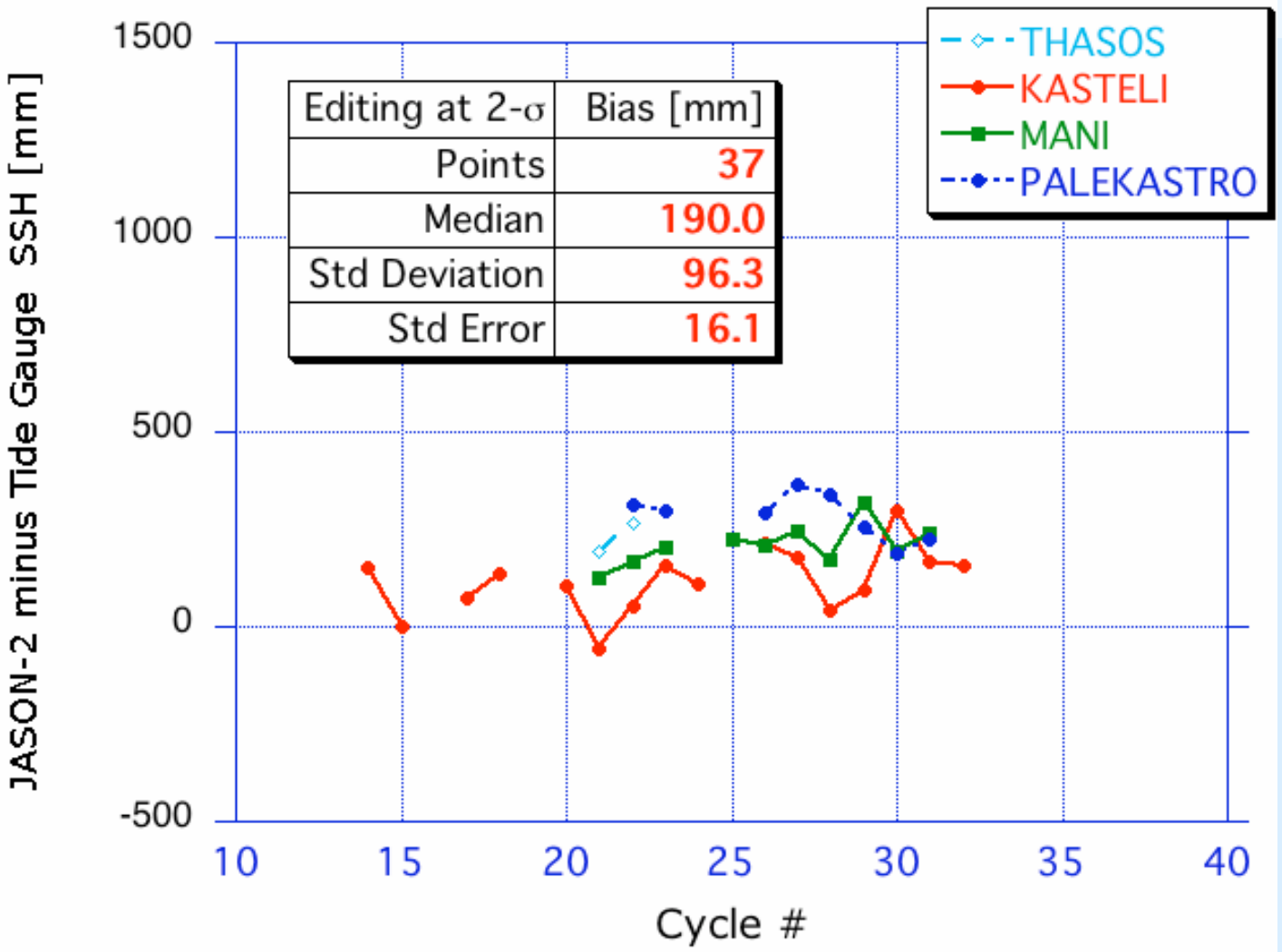
Pass 109: 7 cycles 229.6 ± 47 (formal)

Weighted mean of 9: 234.6 ± 16* mm

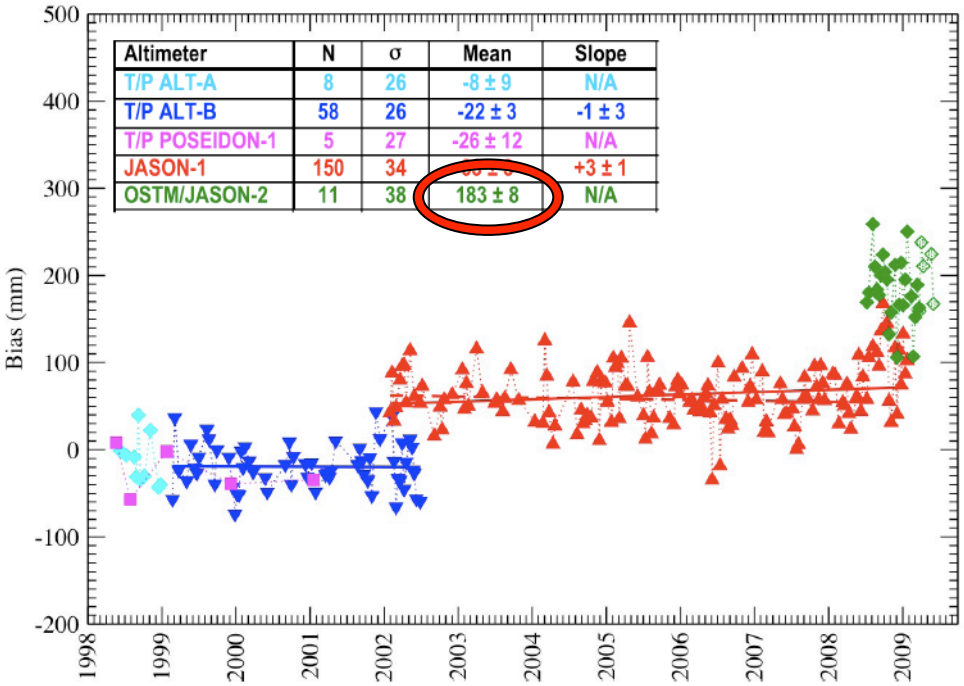
* Statistics of mean based on pass 109 only

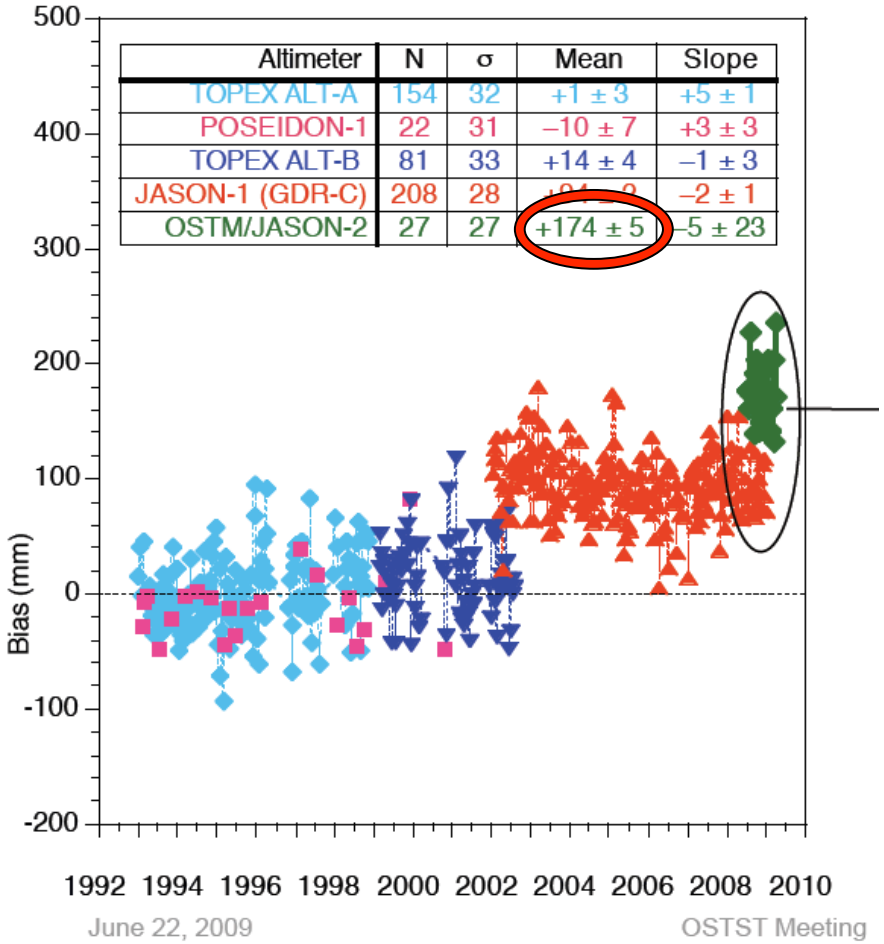


JASON-2 Absolute Cal/Val at eMACnet



JASON-2 Cal/Val at Harvest & Corsica



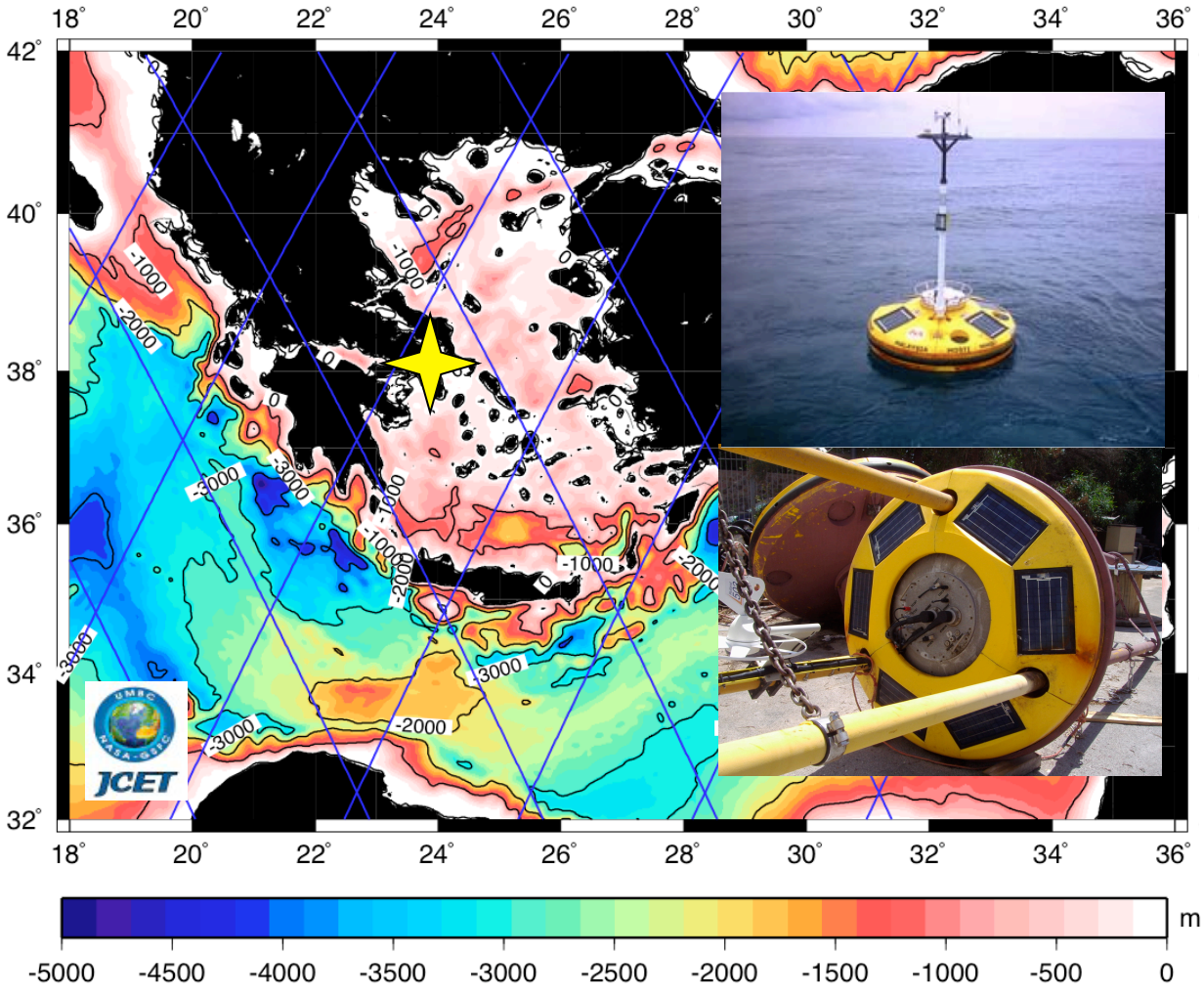


eMACnet Bias: 190 ± 16 mm

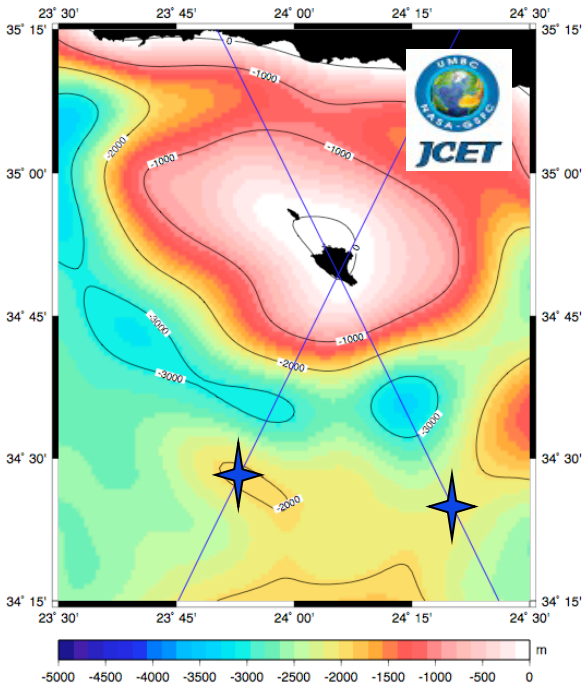
Future Plans / Next Phase

- **KASTELI installation completed this year with GPRS link, internet, and EUMETSAT DCP uplink (TG)**
- **Relocate KARAVE and enable data collection using GPRS link and internet (TG & GPS)**
- **Completed installations at THASOS, PALEKASTRO, and CHIOS**
- **Complete re-analysis of GPS data with ITRF2008 back to 1997**
- **Extend the calibration series with the new GDR-C for JASON 2**
- **Pursue redeployment of mobile SLR (FTLRS?) at Dionysos satellite tracking station (NTUA) in the next 1-2 years (will cover all tracks!!!)**

Eastern Mediterranean Buoy Network



Bathymetry around Gavdos



Possible buoy locations

Prepare for SWOT Mission