

# GOCESeaComb

External calibration/validation of ESA's GOCE mission and contribution to DOT and SLA determination through stochastic combination with heterogeneous data



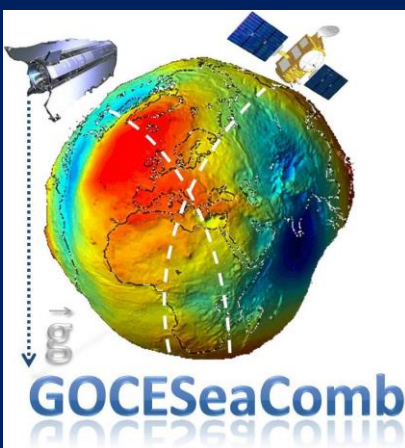
Newsletter Issue 12/30.06.2014

## GOCESeaComb

The **GOCESeaComb** project is funded by the European Space Agency (ESA) within its Scientific Experiment Development Program (PRODEX) following a successful application to the General Secretariat for Research & Technology (GSRT) after an invitation to the Greek scientific community in response to the 1st PRODEX Programme Call for Greece.

Contract: C4000106380

Duration: July 2012 – July 2014



The GOCESeaComb Project Logo

## THE GOCESEA COMB PROJECT CONCLUSION

During the two-year duration of the GOCESeaComb project, all deliverables have been completed according to schedule and all the project goals have been met. The main goals of the GOCESeaComb project that were all met are:

- *To determine the kind and characteristics of the satellite gravity and altimetry data needed to determine the geoid, sea level and DOT.*

This has been achieved with the collection and unification of all available satellite altimetry, satellite gravimetry and terrestrial gravity and GPS/Leveling data.

- *To develop the methodologies to be utilized for the validation of GOCE data and perform their validation against other GGMs and local gravity data.*

This has been performed through the analytical validation of the GOCE models with the degree and error degree variances, 2D and 1D SNR and gain, spectrum evaluation, PSD evaluation, analytical comparison with local gravity, GPS/Leveling and deflection of the vertical data.

- *To develop and apply the methodologies for the optimal combination of GOCE data with altimetric and terrestrial gravity data for sea level and DOT determination in the Mediterranean Sea.*

This has been achieved through the determination of the GOCE03s/DTU2010MSS DOT model and the use of the analytical covariance functions to estimate a final DOT for the Mediterranean Sea. Moreover, the time-varying DOT has been modelled with dedicated spatio-temporal varying covariance functions, while an SLA model for the Mediterranean Sea has been developed as well from the dedicated analytical covariance functions and LSC.

In total, the GOCESeaComb team has participated in five major conferences presenting seven oral and poster presentations followed by five papers in the IAG symposia series. The conference presentations were as follows:

1. Natsiopoulou A, Vergos GS, Tziavos IN (2013) On the determination of EVISAT SLA analytical covariance functions and correlation with climate indexes. Presented at the 2013 EGU General Assembly, Session G1.1 "Recent developments in geodetic theory", April 7th-12th, Vienna, Austria.

2. Natsiopoulou VD, Vergos GS, Tziavos IN (2014) Modeling the barotropic response of the Mediterranean sea level to atmospheric pressure forcing. Presented at the 2014 EGU General Assembly, Session OS2.2 "Advances in understanding of the multi-disciplinary dynamics of the Southern European Seas (Mediterranean and Black Sea)", April 27th - May 2nd, Vienna, Austria.

3. Katsadourou A, Vergos GS, Tziavos IN (2013) Mean dynamic ocean topography determination from recent GOCE/GRACE geopotential models and satellite altimetry data. Presented at the 2013 EGU General Assembly, Session G4.2 “Satellite Gravimetry: GRACE, GOCE and Future Gravity Missions”, April 7th-12th, Vienna, Austria.
4. Kolyvaki E, Vergos GS, Tziavos IN (2013) GRACE induced mass changes over continental and marine areas and correlations with rain-gauge data and oscillation indexes. Presented at the 2013 EGU General Assembly, Session G3.2 “Determination of Mass Transport and Distribution in the Earth System”, April 7th-12th, Vienna, Austria.
5. Tziavos IN, Vergos GS, Grigoriadis VN, Tzanou EA, Natsiopoulou DA (2013) External calibration/validation of ESA’s GOCE mission and contribution to DOT and SLA determination using a stochastic approach - The GOCESeaComb Project. Presented at the 2013 EGU General Assembly, Session G4.2 “Satellite Gravimetry: GRACE, GOCE and Future Gravity Missions”, April 7th-12th, Vienna, Austria.
6. Tziavos IN, Vergos GS, Grigoriadis VN, Tzanou EA, Natsiopoulou DA (2013b) Validation of GOCE/GRACE satellite only and combined global geopotential models over Greece, in the frame of the GOCESeaComb Project. Presented at the 2013 IAG Scientific Assembly, Session 2.2 “Global Gravity Field Models”, September 1st-6th, Potsdam, Germany.
7. Vergos GS, Natsiopoulou DA, Tziavos IN, Grigoriadis VN, Tzanou EA (2014) DOT and SLA stationary and time-varying analytical covariance functions for LSC-based heterogeneous data combination. Presented at the 2014 EGU General Assembly, Session G1.1 “Recent developments in geodetic theory”, April 27th - May 2nd, Vienna, Austria.

The four papers already published are as follows:

1. Grigoriadis VN, Kotsakis C, Tziavos IN, Vergos GS (in press) Estimation of the geopotential value  $W_0$  for the local vertical datum of continental Greece using EGM08 and GPS/leveling data. Accepted for publication to “Gravity, Geoid and Height Systems 2012”, International Association of Geodesy Symposia Vol. 141, Springer Berlin Heidelberg New York.
2. Tziavos IN, Vergos GS, Grigoriadis VN, Tzanou EA, Natsiopoulou DA (in press) Validation of GOCE/GRACE satellite only and combined global geopotential models over Greece, in the frame of the GOCESeaComb Project. Accepted for publication to “2013 IAG Scientific Assembly”, International Association of Geodesy Symposia Vol. 142, Springer Berlin Heidelberg New York.
3. Vergos GS, Grigoriadis VN, Tziavos IN, Kotsakis C (in press) Evaluation of GOCE/GRACE Global Geopotential Models over Greece with collocated GPS/Levelling observations and local gravity data. Accepted for publication to “Gravity, Geoid and Height Systems 2012”, International Association of Geodesy Symposia Vol. 141, Springer Berlin Heidelberg New York.
4. Vergos GS, Natsiopoulou DA, Tziavos IN (2013) Sea level anomaly and dynamic ocean topography analytical covariance functions in the Mediterranean Sea from ENVISAT data. European Space Agency “20 Years of progress in radar altimetry”, ESA Publications SP-710.

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