ONGOING TOPEX/POSEIDON EXTENDED MISSION RESEARCH AT THE NATIONAL SURVEY AND CADASTRE - DENMARK

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The Geodetic Division, National Survey and Cadastre (also known as KMS) contributes to TOPEX/POSEIDON (T/P) related altimetric research mainly within the fields of global and regional ocean tides modelling, accuracy assessment of recent ocean tide models, sea surface variability and sea surface temperature investigations, and improved global mean sea surface determination.

Highlights from on-going research fields related to the T/P Extended Mission are presented here.

Ocean tides

Global multimission ocean tide modelling.

A new method of merging T/P data with observations from ERS-1 and GEOSAT has been used to improve the K1 constituent at high latitudes [Andersen and Knudsen, 1997].

Regional ocean tide modelling - the M4 constituents

On the European shelf several shallow tidal constituents have resolvable amplitude from T/P altimetry. Especially, the M4 constituent exceeds 0.5 metres at some near-coastal locations. Initial investigations have recently shown that the constituent can be accurately modelled from T/P altimetry [Andersen and Leeuwenburgh, 1997] (Figure 1).

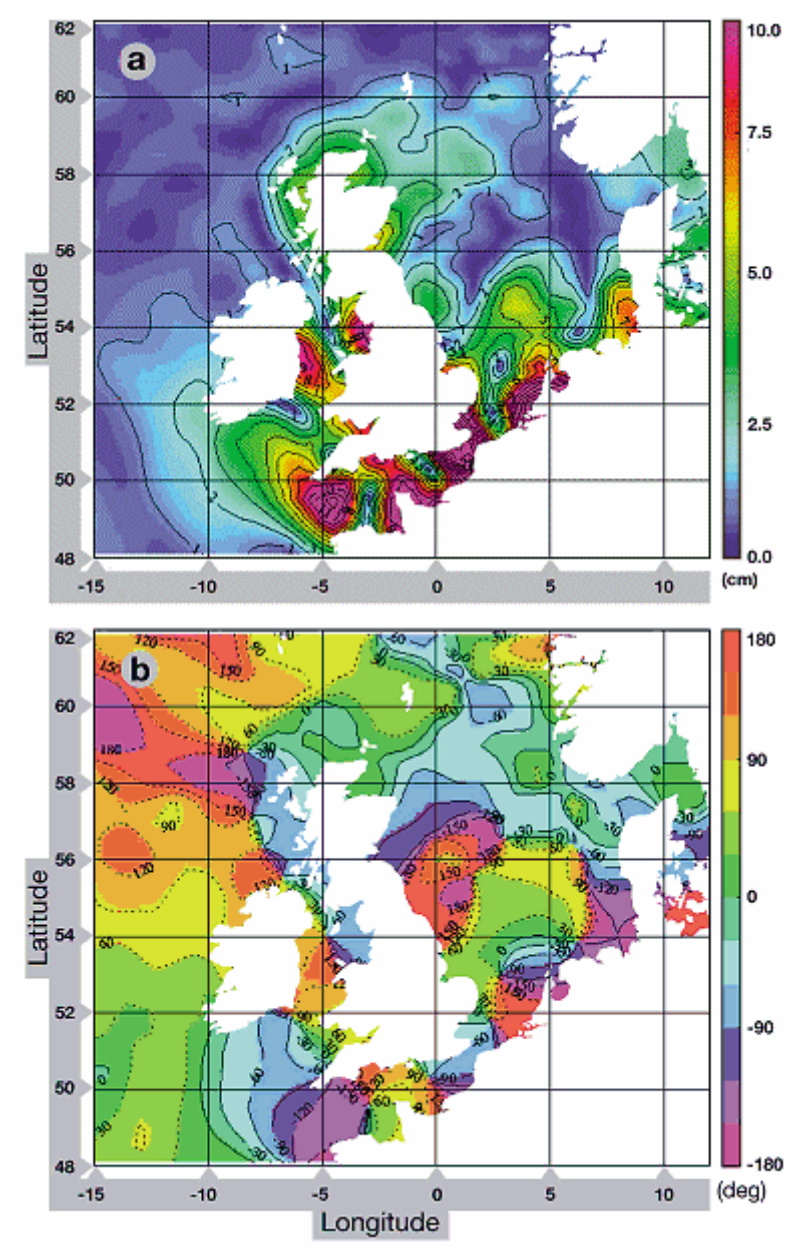

Figure 1
The shallow water M4 constituent revealed from TOPEX/POSEIDON. (a) is amplitudes in cm and

(b) is phase lag in degrees with respect to Greenwich.

Initial investigations into the stability of estimated T/P ocean tide constituents indicate, that major ocean tide constituents in this shallow water region have annual variations ranging up to five percent of the tidal amplitude in the eastern North Sea.

Accuracy assessment of recent ocean tide models

The accuracy of recent ocean tide models has been investigated by Andersen et al. [1995] for models released in 1994 and by Shum et al. [1996] for models released in 1995 for inclusion in future updated T/P GDRs. Recent work by Smith and Andersen [1996] concludes that "centimeter" errors are visible in all recent ocean tide models in the deep ocean, and that these errors are related to basin boundary effects in the underlying hydrodynamic FES94.1 ocean tide model, bathymetry induced errors and errors due to seasonal coverage of observations.

Trend and seasonal cycle of sea surface height and sea surface temperature

Sea level data from the T/P mission and sea surface temperature data from the Along Track Scanning Radiometer onboard the ERS-1 satellite are used in a study of the spatial characteristics of the variability associated with the annual cycles, 1.5- and 3.0-year cycles, and the linear trends. The results show a variety of similarities between the two quantities (Figure 2). Characteristics associated with the annual variation were investigated by Knudsen et al. [1995], and Knudsen and Andersen [1997] presented characteristics associated with the trends.

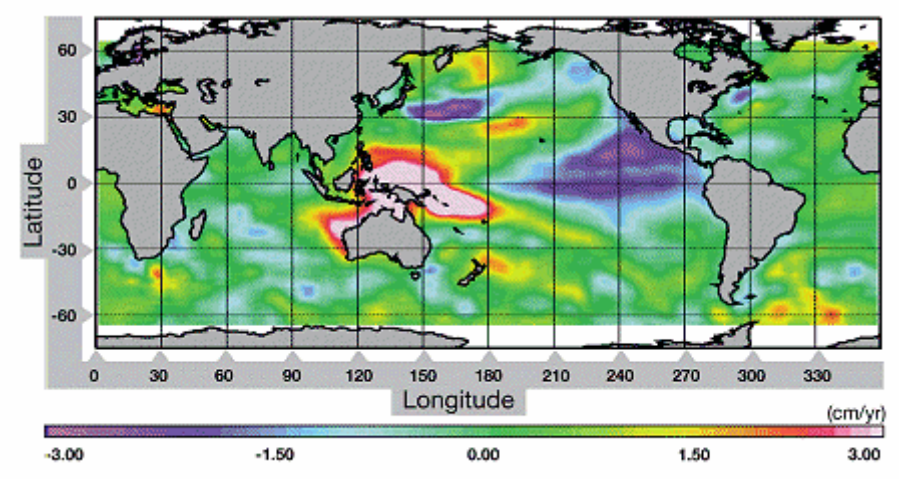

Figure 2
Trends in sea level from 4.3 years of TOPEX/POSEIDON data. Amplitudes are cm/year

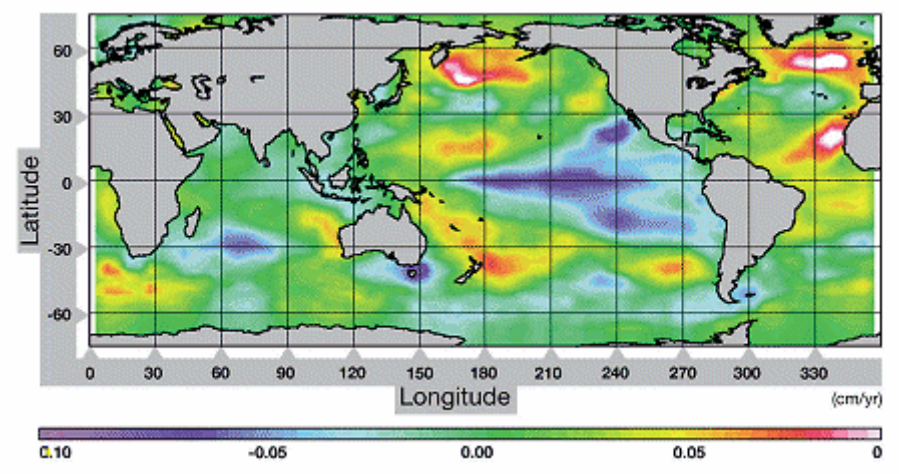

Figure 3
Trends in sea surface temperature from nearly 4 years of ERS-1 ATSR data. Amplitudes are °C/year

Global marine gravity and mean sea surface

A new global enhanced marine gravity field has been derived from the Geosat and ERS-1 geodetic missions [Andersen and Knudsen, 1997]. Subsequently, a mean sea surface has been derived and fitted to T/P observations [Knudsen and Andersen, 1997]. This surface fits T/P mean sea surface heights to within 5 cm and slopes within 3 mm/km.

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