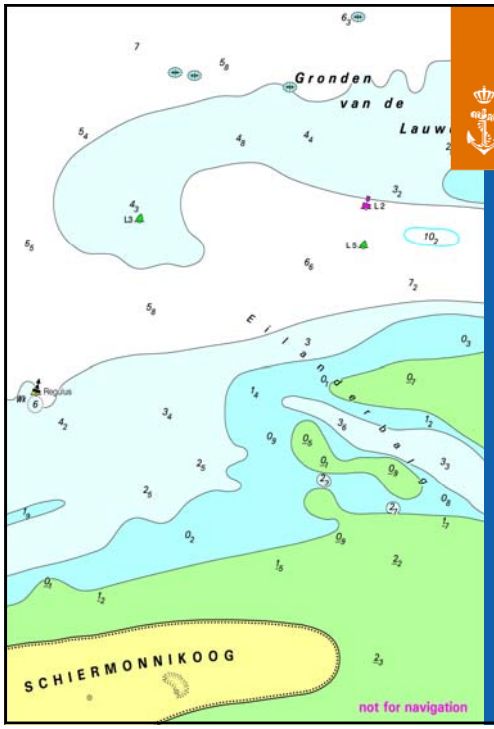


Royal Netherlands Navy
Hydrographic Service

Unifying vertical reference surfaces in the North Sea

An overview of developments

TU Delft Delft University of Technology

Deltares Enabling Delta Life

Leendert Dorst, Cornelis Slobbe, Roland Klees, Martin Verlaan, Thijs Ligteringen

2 November 2010

Introduction

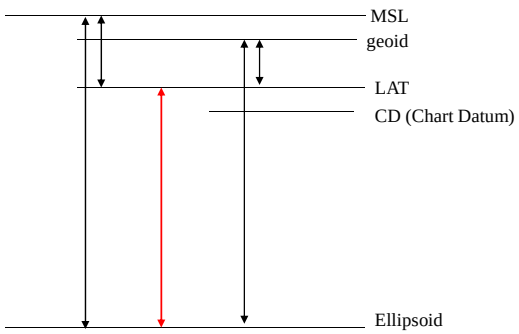
Vertical references:

Marine	Terrestrial
MSL	Geoid
LAT (IHO TR!)	Ellipsoid
Chart Datum	National system

Complications of these differences:
Coastal management tasks require merging;
GNSS heights cannot be used;
Reference level of hydrodynamic models problematic.

2

Theory



3

Theory

Geoid

Equipotential surface = reference surface of hydrodynamic model

Defined terrestrially

MSL

Is not defined on land

Can be observed at tide gauges

Can be observed outside the littoral zone by radar altimetry

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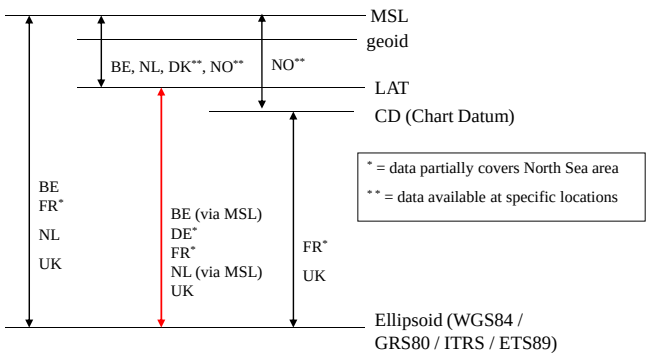
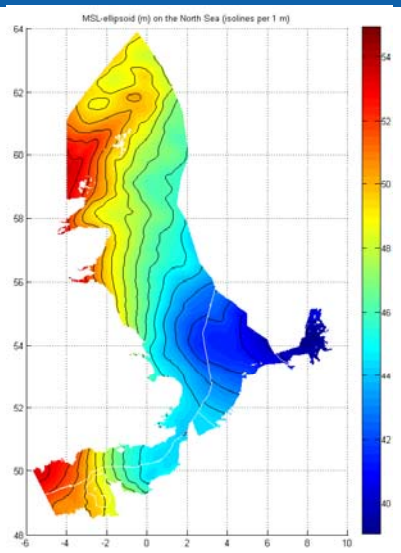
NSHC-TWG work



5

NSHC-TWG work

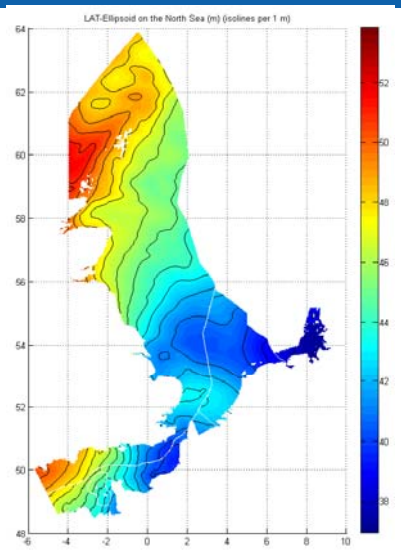
Differences MSL-ellipsoid smaller than 0.5 m.



6

NSHC-TWG work

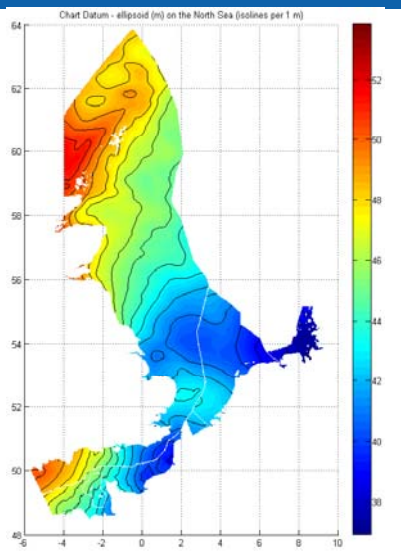
Differences LAT-ellipsoid smaller than 0.5 m.



7

NSHC-TWG work

Differences CD-ellipsoid smaller than 0.8 m.



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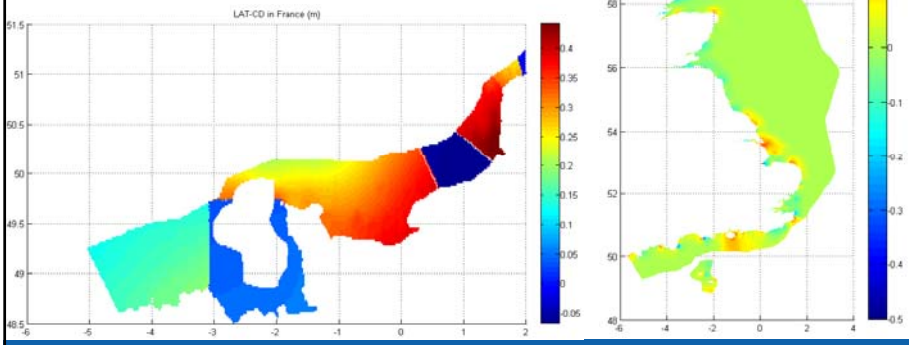
NSHC-TWG work

Differences CD-ellipsoid smaller than 0.8 m.



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Bringing Land And Sea Together

BLAST WP3:
developing the marine and coastal reference base
TUDelft/Deltares, University College London, Danish TU

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TUDelft/Deltares contribution

Connect the geoid with the other reference surfaces
Using:
(Retracked) radar altimetry
Gravimetric data from various sources
Hydrodynamic model DCSM
Iterative model calibration

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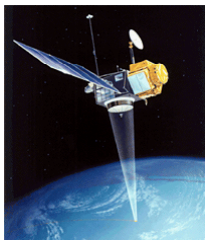
Radar altimetry

+ High-spatial resolution
+ Homogenous coverage
- Gaps along the coast
- Observes instantaneous sea surface
→ Requires hydrodynamic model to reduce heights to equipotential surface.



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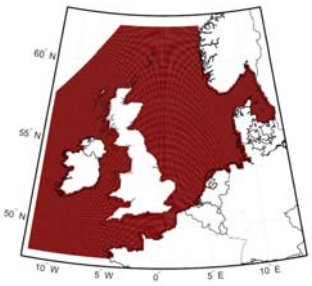
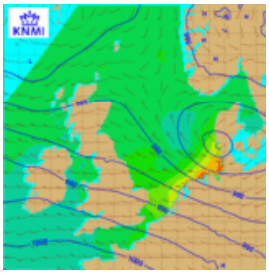
DCSM

Used operationally to forecast water levels and storm surges in the North Sea.

Calculates the sea level and the depth-averaged current (2D version) on the Northwest European Continental Shelf.





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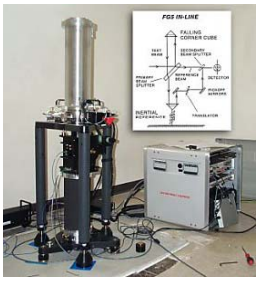
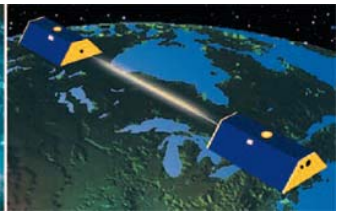
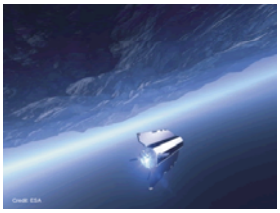
Gravimetry

Satellite gravimetry: low spatial resolution

Airborne/marine/terrestrial gravimetry: inhomogeneous coverage







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Conclusion

NSHC-TWG surfaces neither consistent nor fully covering North Sea.

BLAST provides opportunities to create common reference surfaces.

This has the potential to create consistent depth model of North Sea,

and it enables marine and terrestrial data merging.

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