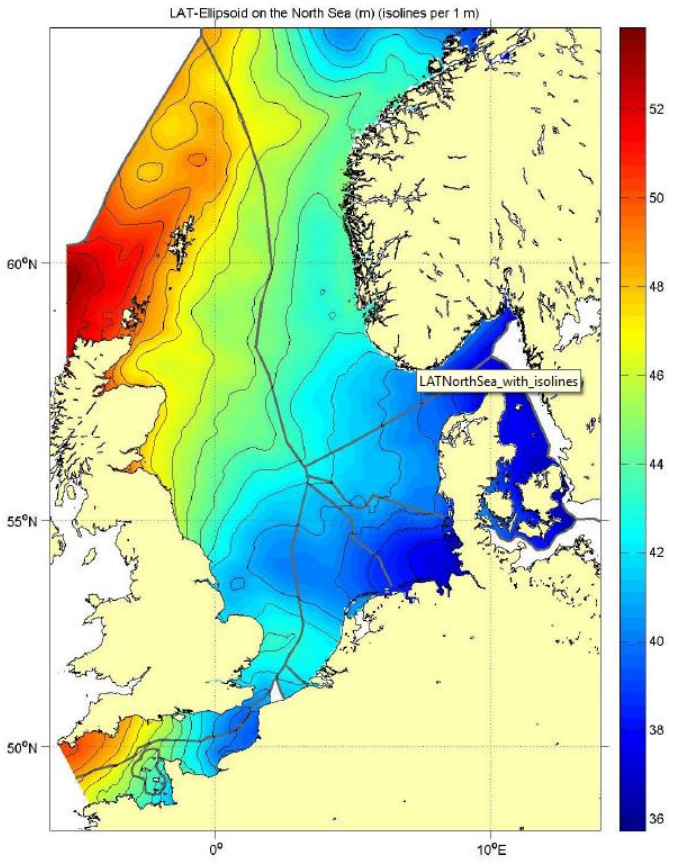
Royal Netherlands Navy

Merging land and sea data together into a seamless chart

NL GEO2018, the new Dutch quasi-geoid model

Hydrographic Service
Geodesy and Tides

(Seamless) LAT on the North Sea



NSHC TWG WP 18/01: Improve North Sea wide realization of reference surfaces.
The ultimate goal → a seamless LAT for the North Sea.

The connection of reference surfaces between land and sea becomes more important.

Connection between land and sea becomes more important

How to make reliable simulations of flood events?

How to assess the impact of rising sea level on the coastal morphology?

Compound Coordinate Reference Systems (CRS)

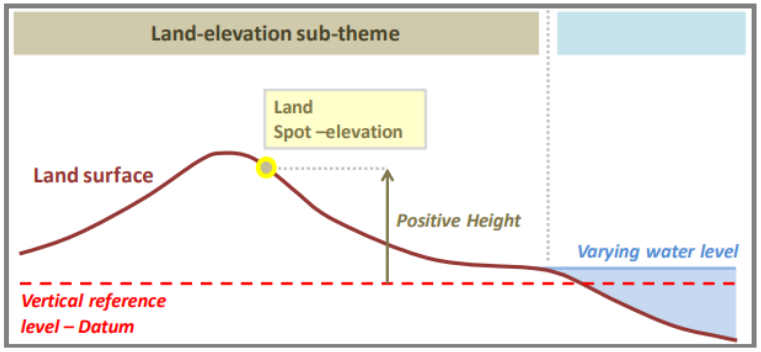
A compound CRS is a combination of two or more single CRSs

The components of a compound CRS must be independent
A horizontal and vertical CRS, for example,
are independent while two vertical CRSs are not.

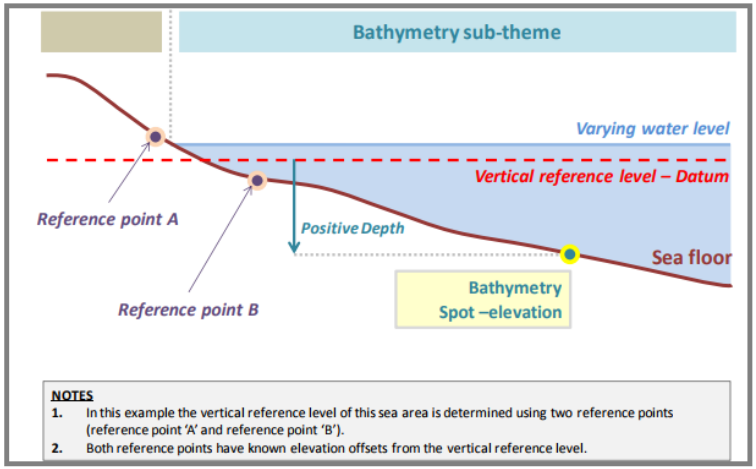
Compound (North) Sea:	CRS vertical	= Lowest Astronomical Tide (LAT)
	CRS horizontal	= ITRF14 (WGS84/ETRS89)
Compound (North) Sea & Land →	CRS vertical	= ?
	CRS horizontal	= ?

See also S100_Ed4.0.0 Chapter6_CRS

Differences vertical references land-sea



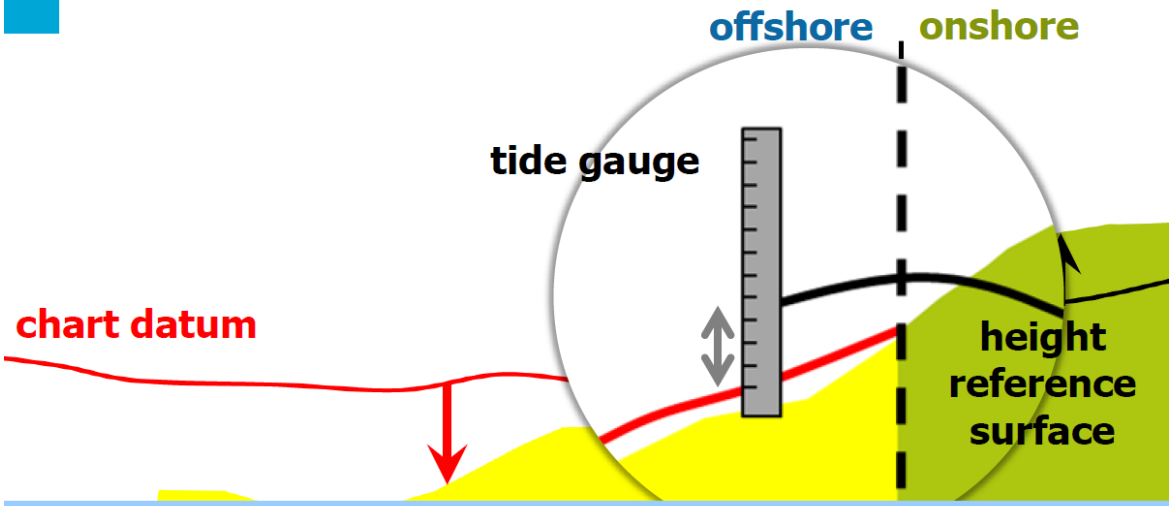
- Local geoid as vertical reference
- Local geodetic datum as horizontal reference
- Land spot elevation → positive height
- Land administration perspective merging land and sea together → the data at sea needs to be converted into the local horizontal and vertical Coordinate Reference System (CRS).



- LAT as vertical reference.
- ITRF14 (WGS84/ETRS89) as horizontal reference.
- Bathymetry spot elevation → positive depth.
- Maritime perspective merging land and sea together → one common Coordinate Reference System (CRS) is needed (WGS84 & LAT).

Source reference: D2.8.II.1 INSPIRE Data Specification on *Elevation* – Technical Guidelines

The problem…

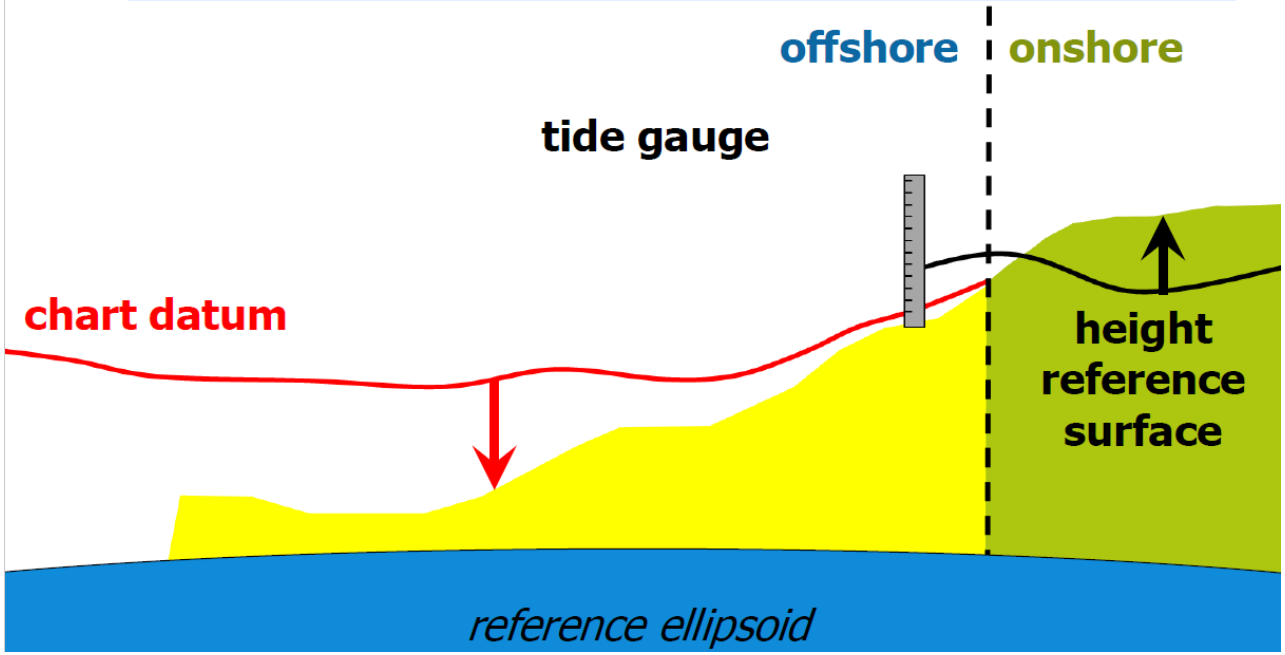


Separation between chart datum and height reference surface is a *spatially varying* function, which is only known at tide gauges!

This separation must be known everywhere for coastal zone management in a changing climate!

The solution…

Refer chart datum and height reference surface to a common reference surface!



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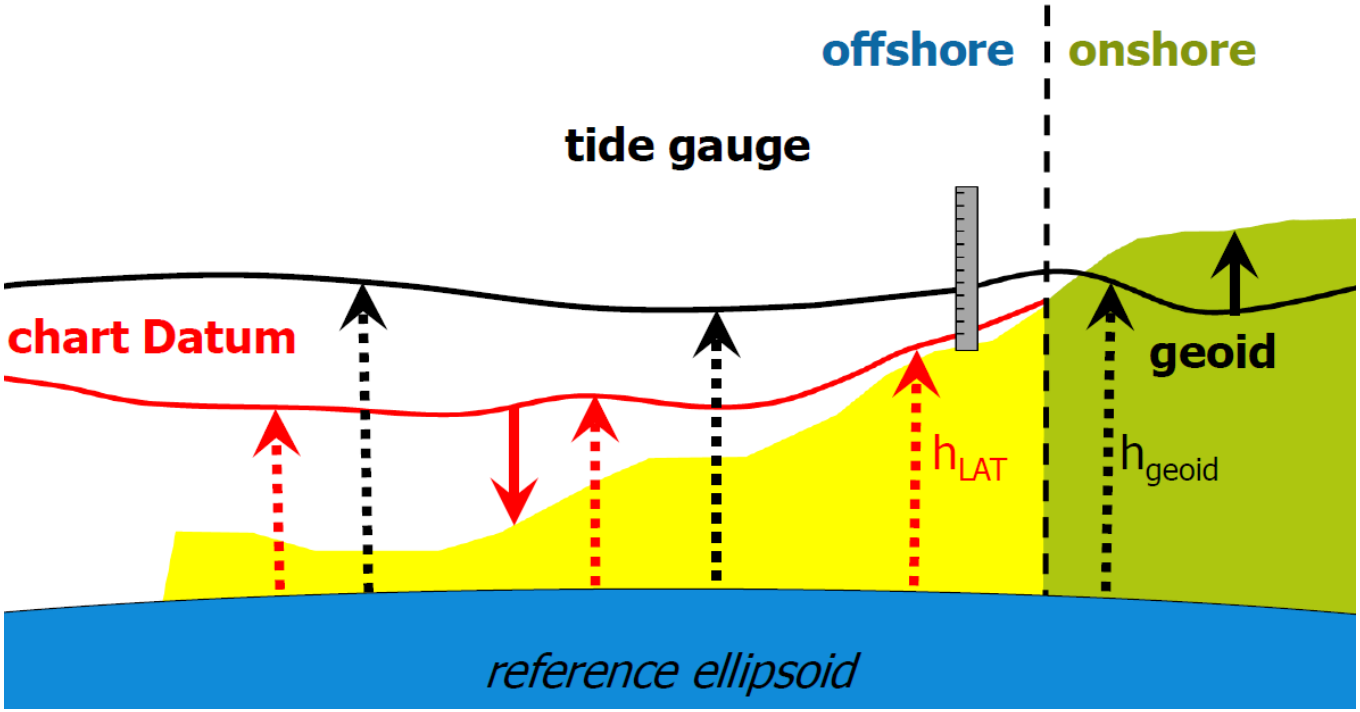
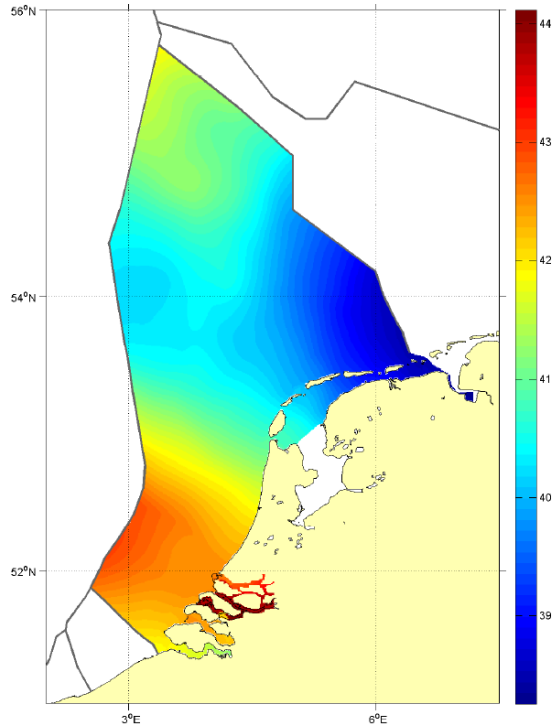
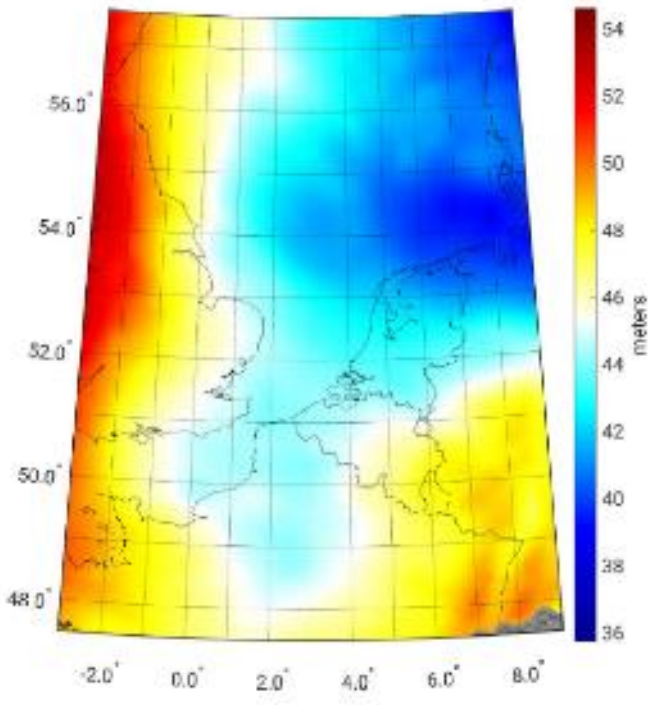


The Dutch approach (1)



NL LAT2018

Region	Nr	rms (cm)
North Sea	19	**6.6**



NLGEO2018 – gravimetric quasi-geoid

Region	Nr	Rms (cm)
Netherlands	82	2.0

The Dutch approach.

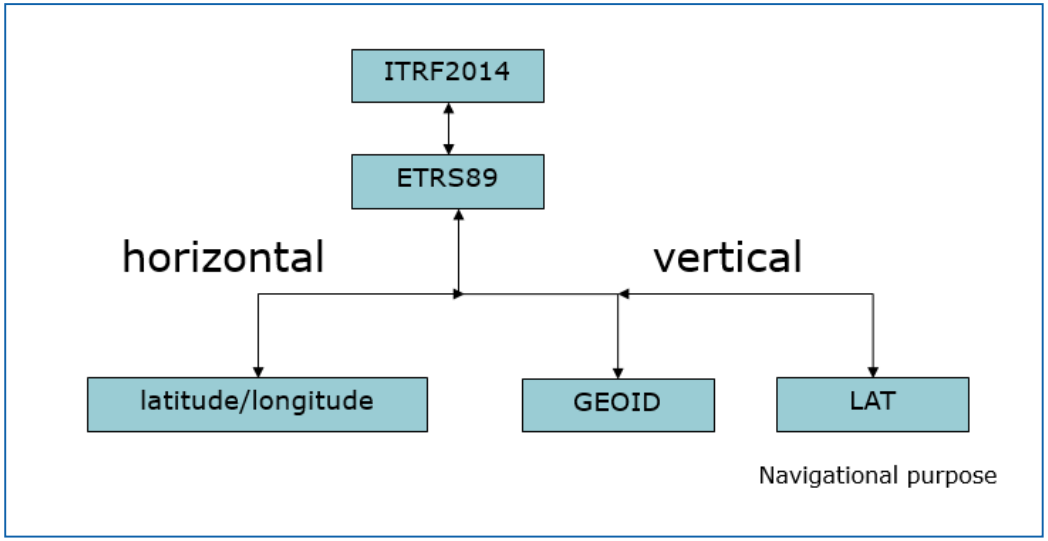
The Dutch approach to realize chart datum with respect to a reference ellipsoid (GRS80) uses the geoid rather than the MSL as the intermediate surface.

For details about the approach to realize h-LAT and h-geoid I refer to the TU Delft – Nevref research team (R. Klees, D.C. Slobbe)

Details: Realisation_of_a_mutually-concistent_set_of_on-and_offshore_Vertical_reference_surfaces-NLD.pdf

https://www.iho.int/mtg_docs/com_wg/IHOTC/TWCWG3/TWCWG3.htm

Coordinate Reference System at Sea



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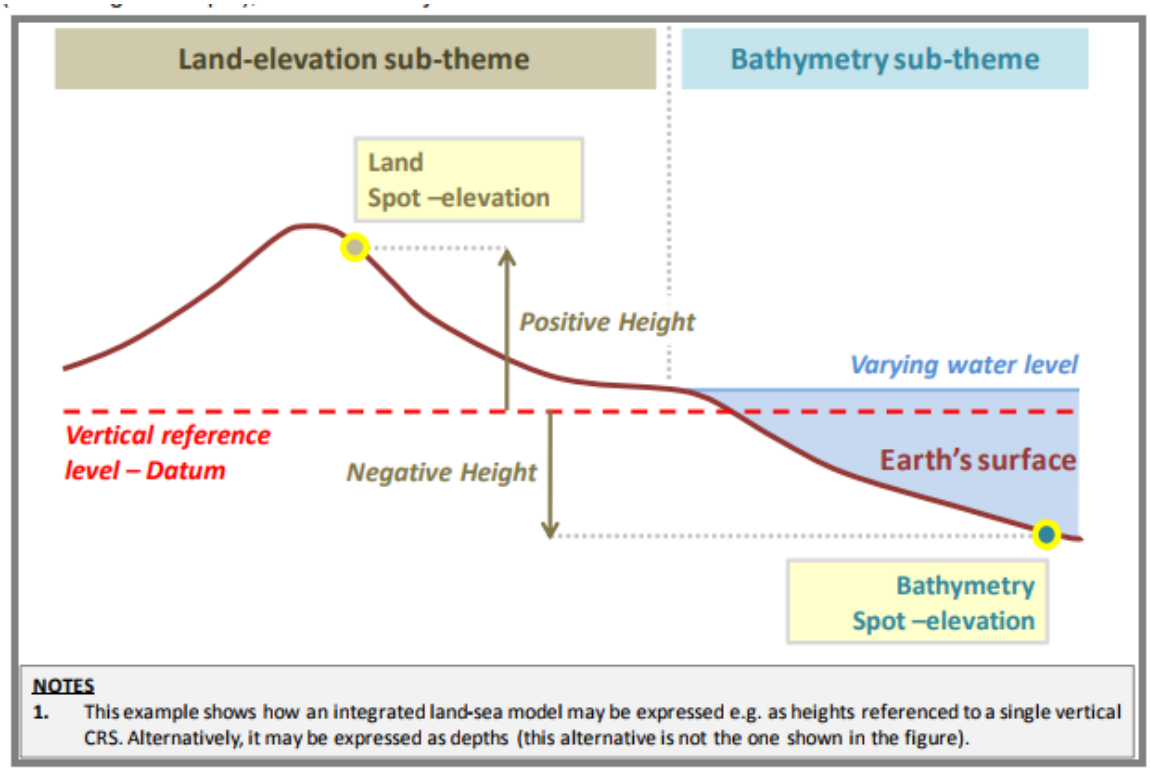
Compound (North) Sea & Land →	CRS vertical	= Geoid
	CRS horizontal	= ITRF (WGS84/ETRS89)

See also S100_Ed4.0.0 Chapter6_CRS

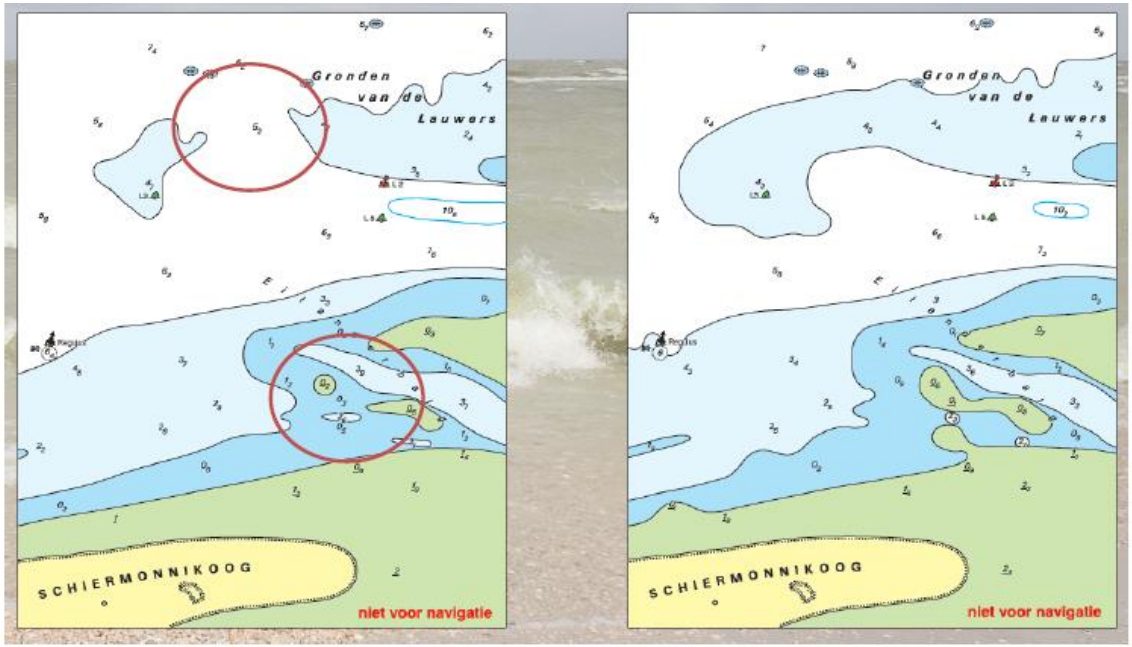
Consequences 1



Source reference: D2.8.II.1 INSPIRE Data Specification on *Elevation* – Technical Guidelines

Consequences 2

GEIOD or LAT. So what?



Consequences 3

GEOID or LAT: legal consequences