

Netherlands Partnership
Geodetic Infrastructure

NSGI

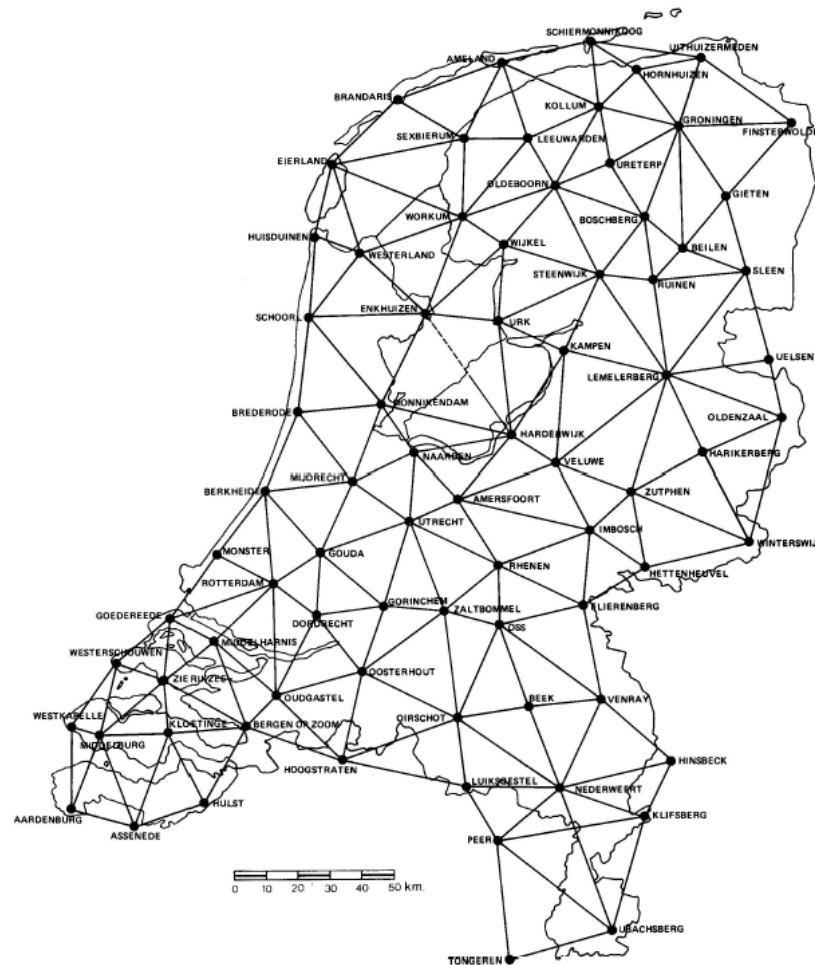


Case Study: The Netherlands

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Background

- ETRS89 recommended
- Most users in national system RD: stereographic projection on 1888-1909 triangulation

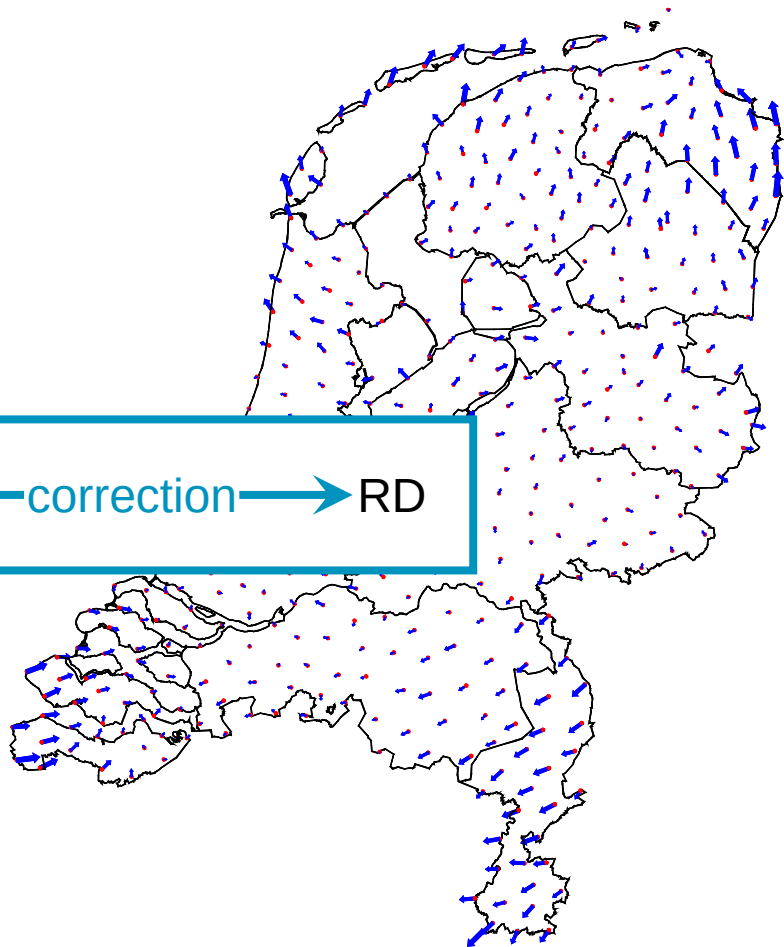


Background

- RD2000: replace trig points by GNSS stations and transformation

ETRS89 — 7 parameters — projection — correction —→ RD

- New measurements:
update 7 parameters if >1 cm



Problem

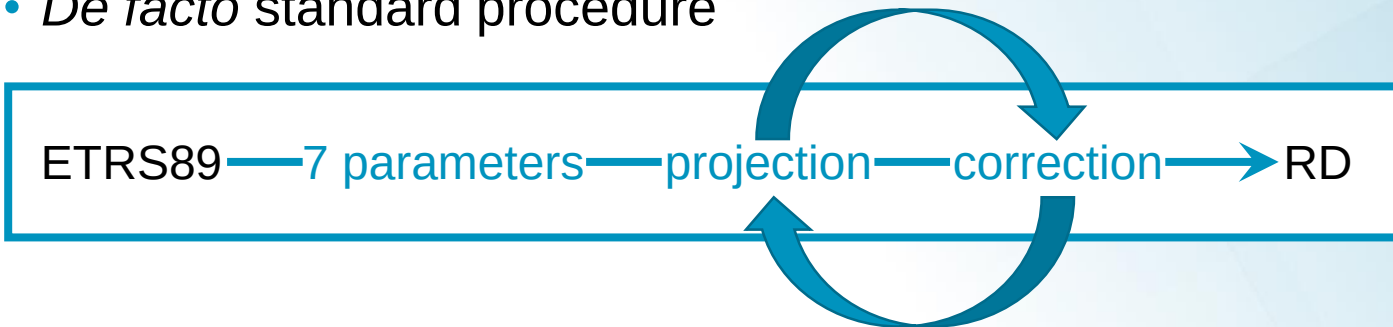
- Transformation in surveying hardware & software, but not in GIS and other software (e.g. PROJ.)

Result: 25 cm errors

- Projection needed, but no new projection: as transformation is needed for transition

Solution

- New NTv2 correction grid
- *De facto* standard procedure



Other improvements:

- Update 7 parameters
- Update geoid (EEZ of North Sea)
- Correction grid improvements

Solution

- New NTv2 grid
- *De facto* standard procedure

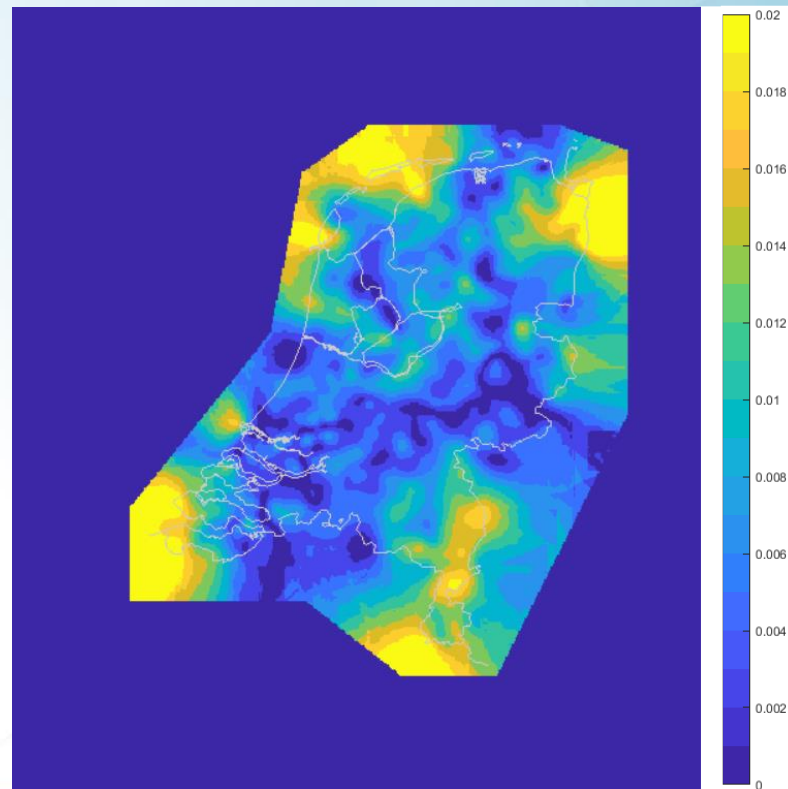
ETRS89 — 7 parameters — correction — projection —> RD

Other improvements:

- Update 7 parameters
- Update geoid (EEZ of North Sea)
- Correction grid improvements

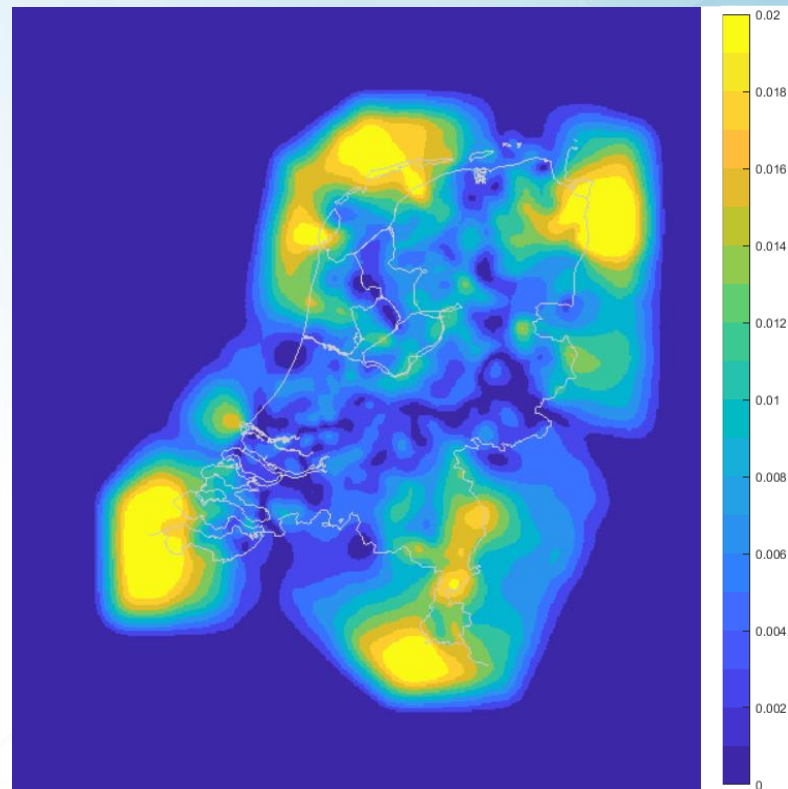
Correction grid improvements

- Correction at sea:
25 km transition to zero
- Smoothing resampling:
1x1 km $\rightarrow$ 45" x 72" ($\approx 1.4 \times 1.4$ km)
360" x 360" ($\approx 11 \times 7$ km)



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25 km transition to zero
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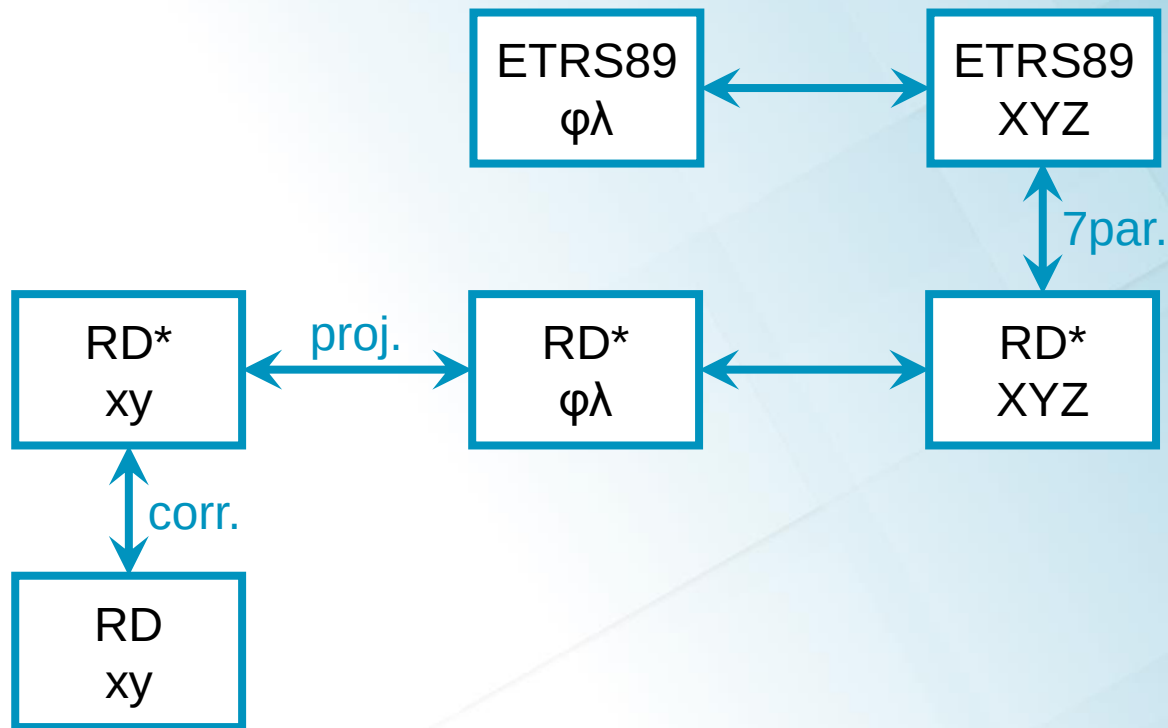
Correction grid improvements

- Larger grid around transition zone and EEZ
- Different grid spacings
 - Dense: 45" x 72" ($\approx 1.4 \times 1.4$ km)
 - Course: 360" x 360" ($\approx 11 \times 7$ km)



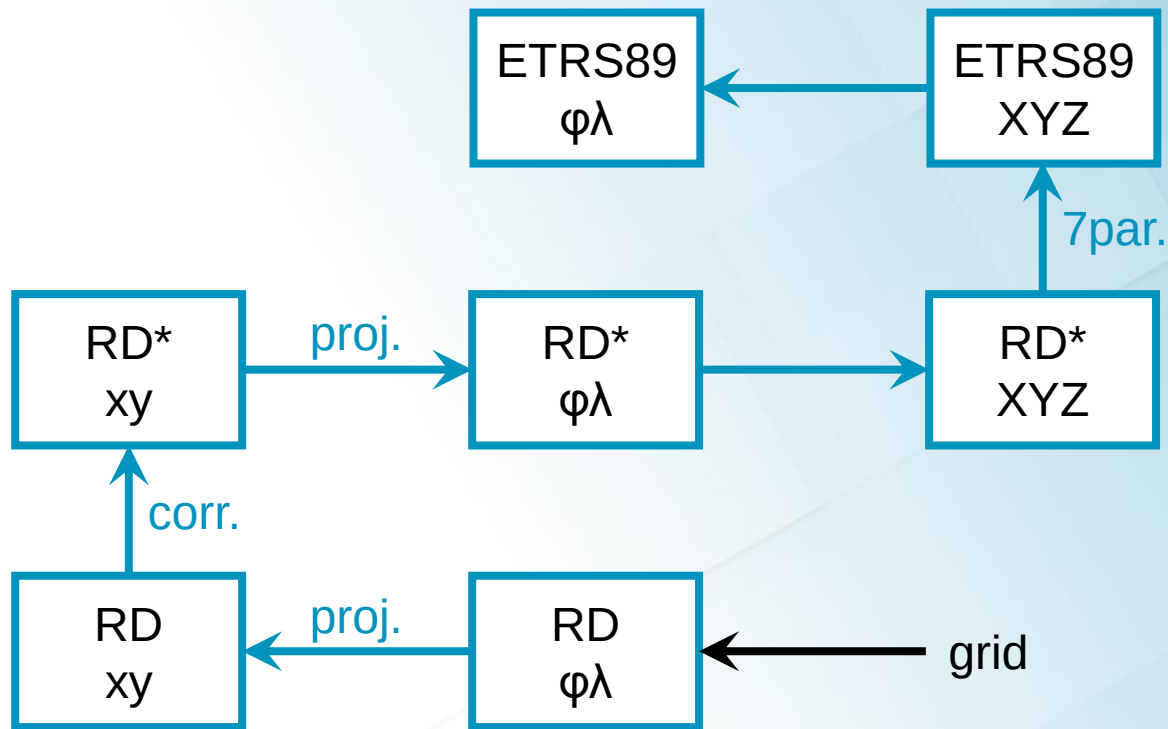
Conversion to ellipsoidal grid

Old procedure



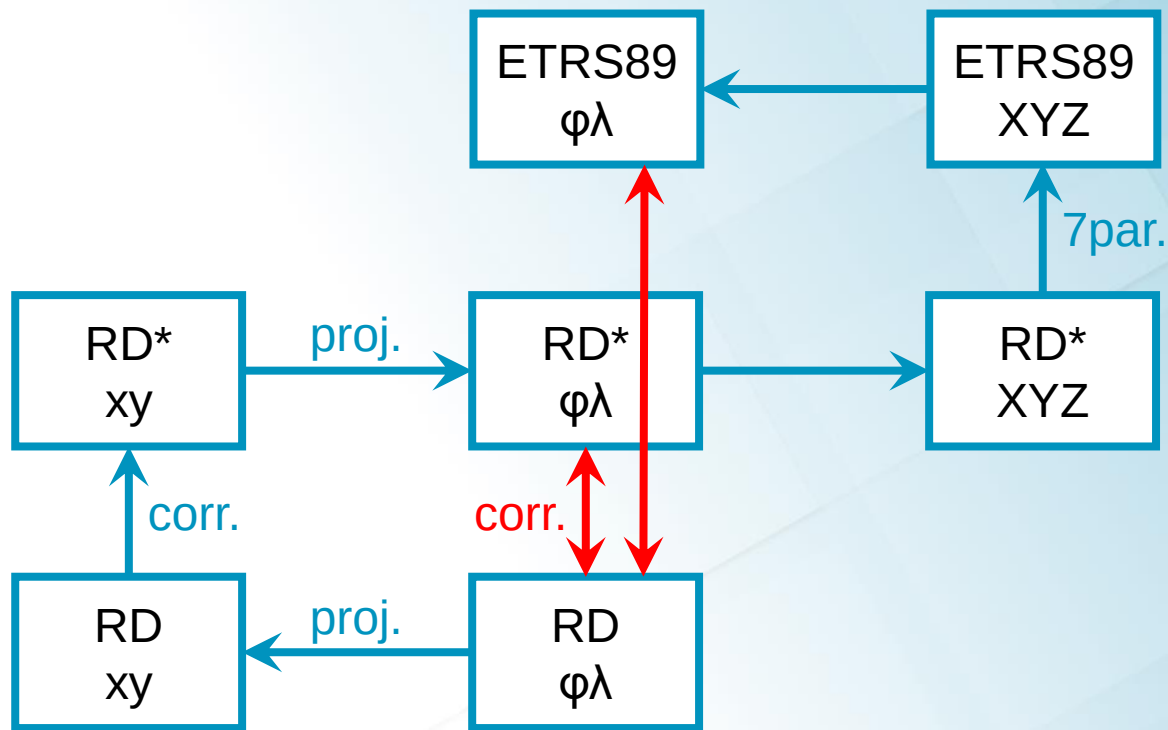
Conversion to ellipsoidal grid

Compute new grid



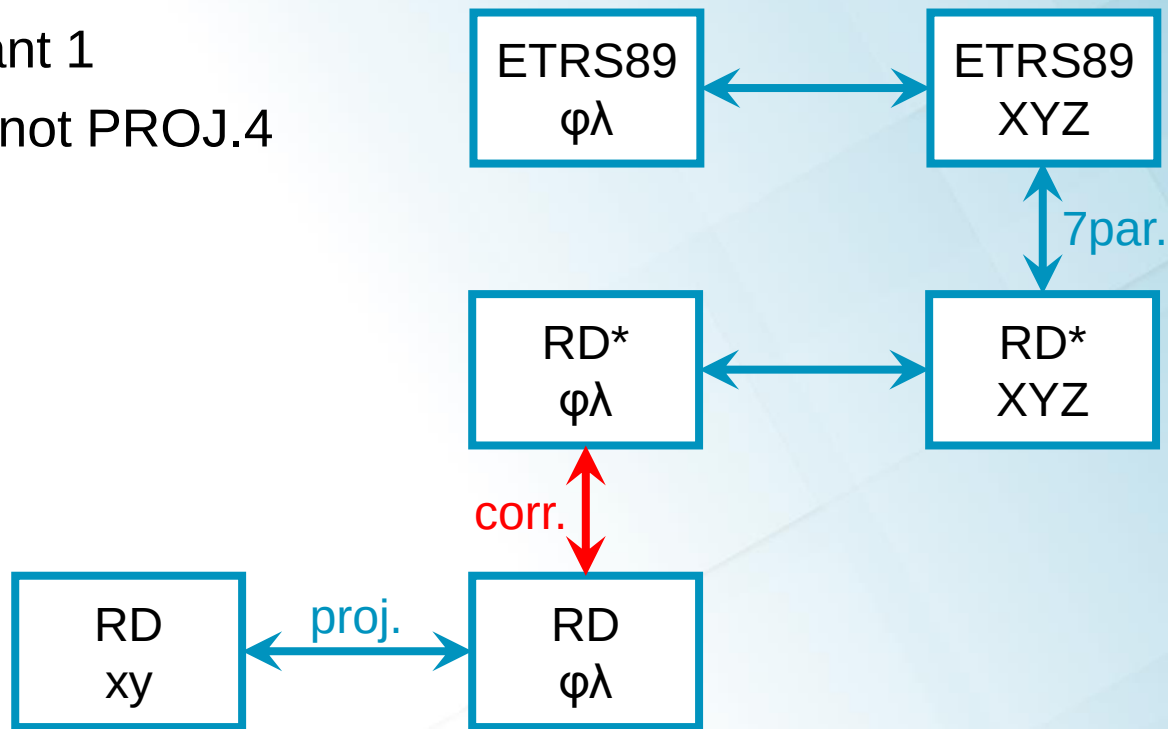
Conversion to ellipsoidal grid

Compute new grid



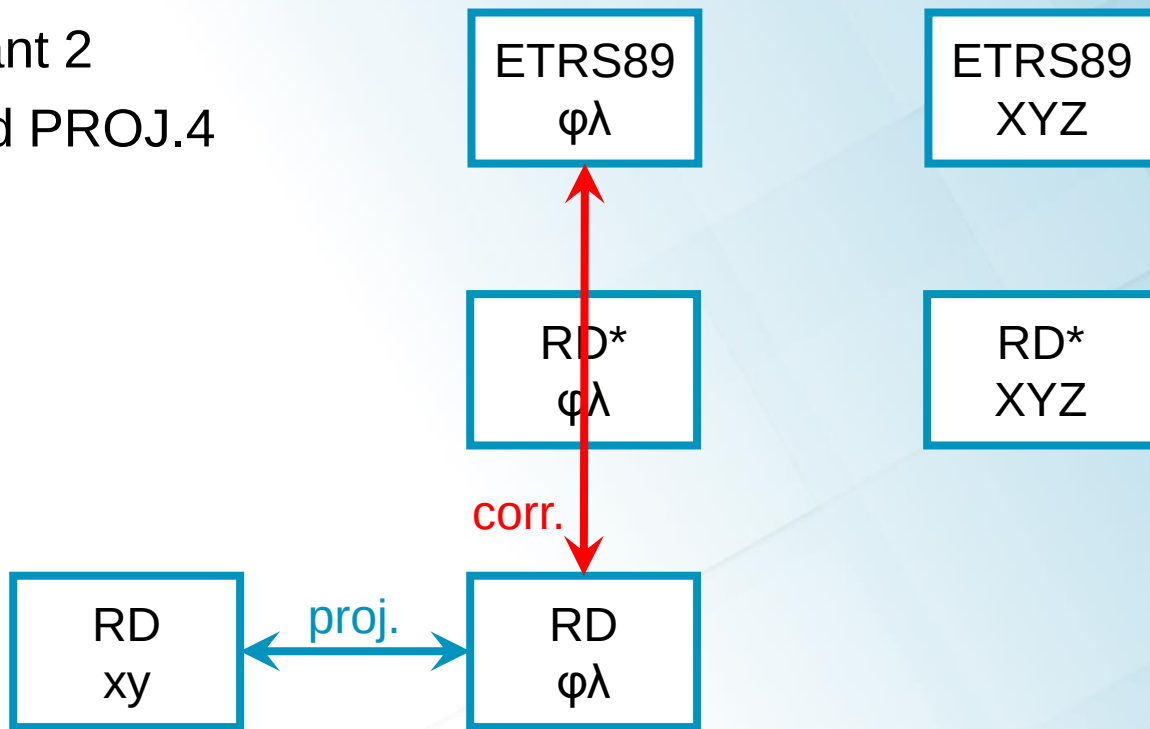
Conversion to ellipsoidal grid

New procedure variant 1
possible in PROJ.6, not PROJ.4



Conversion to ellipsoidal grid

New procedure variant 2
possible PROJ.6 and PROJ.4
(datum shift in grid)



Easier to implement

- No custom C++ code, but PROJ. library
- No full copyrights on grid files (CC BY 4.0)

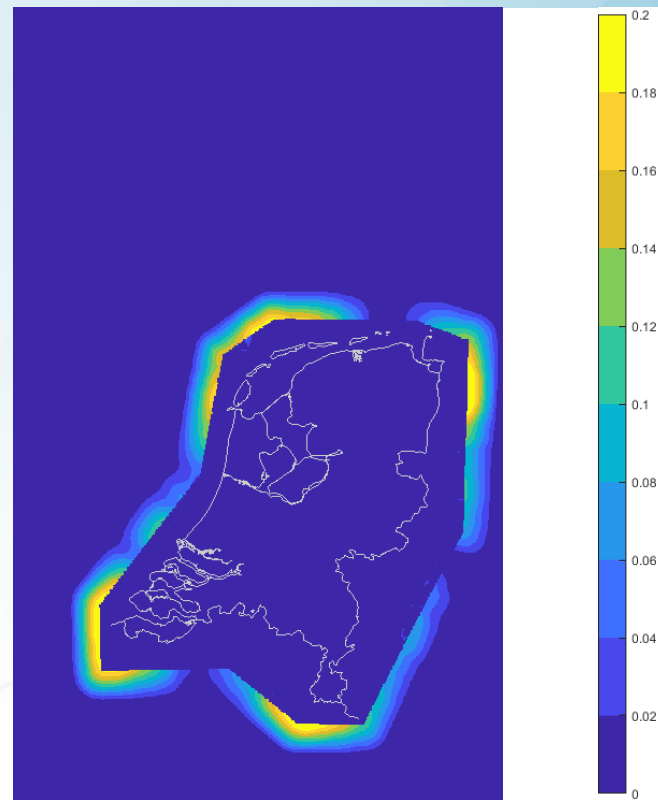
Differences with old procedure

Horizontal at NAP = 0

- Administrative area: < 1 cm
- Former validity area: < 5 cm
- EEZ transition zone: < 25 cm

Height (new geoid)

- Former validity area: < 3 cm



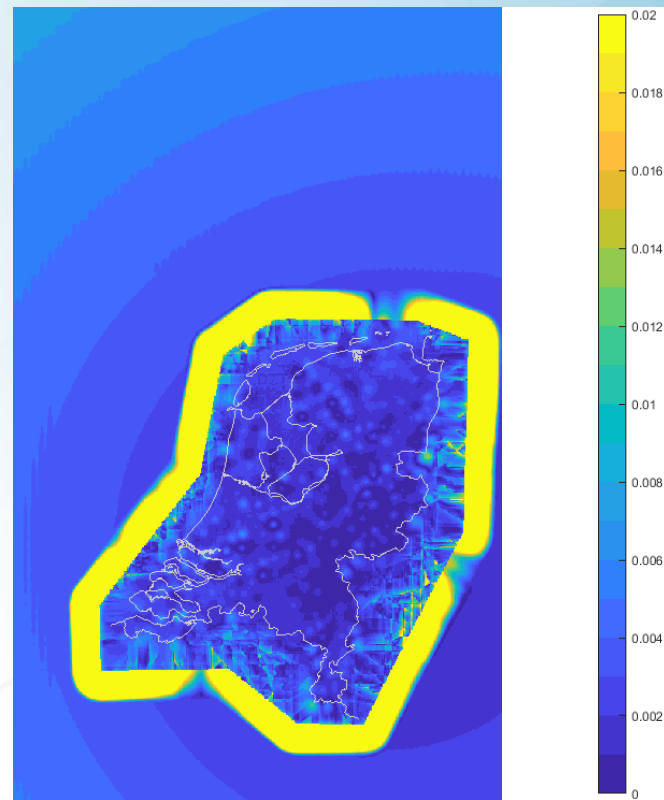
Differences with old procedure

Horizontal at NAP = 0

- Administrative area: < 1 cm
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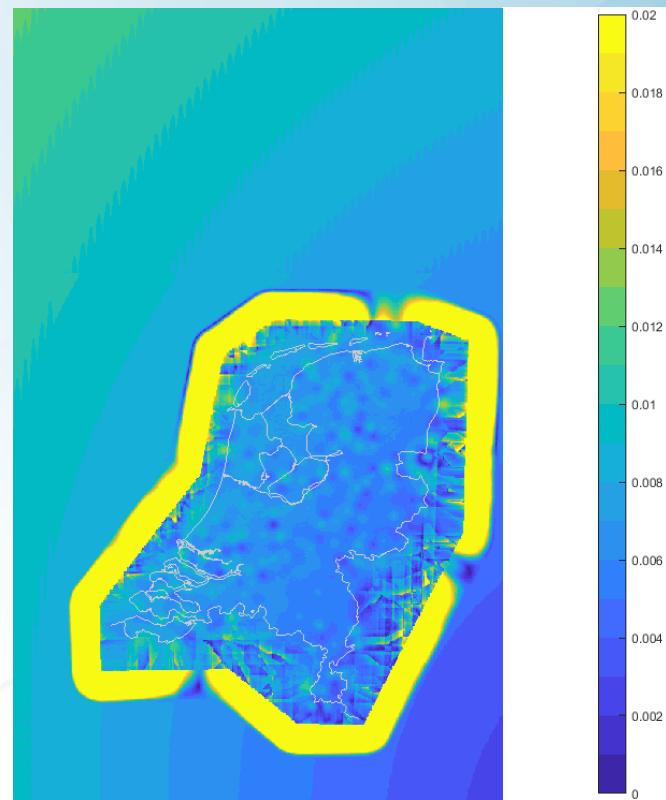
Height (new geoid)

- Former validity area: < 3 cm



Differences with old procedure

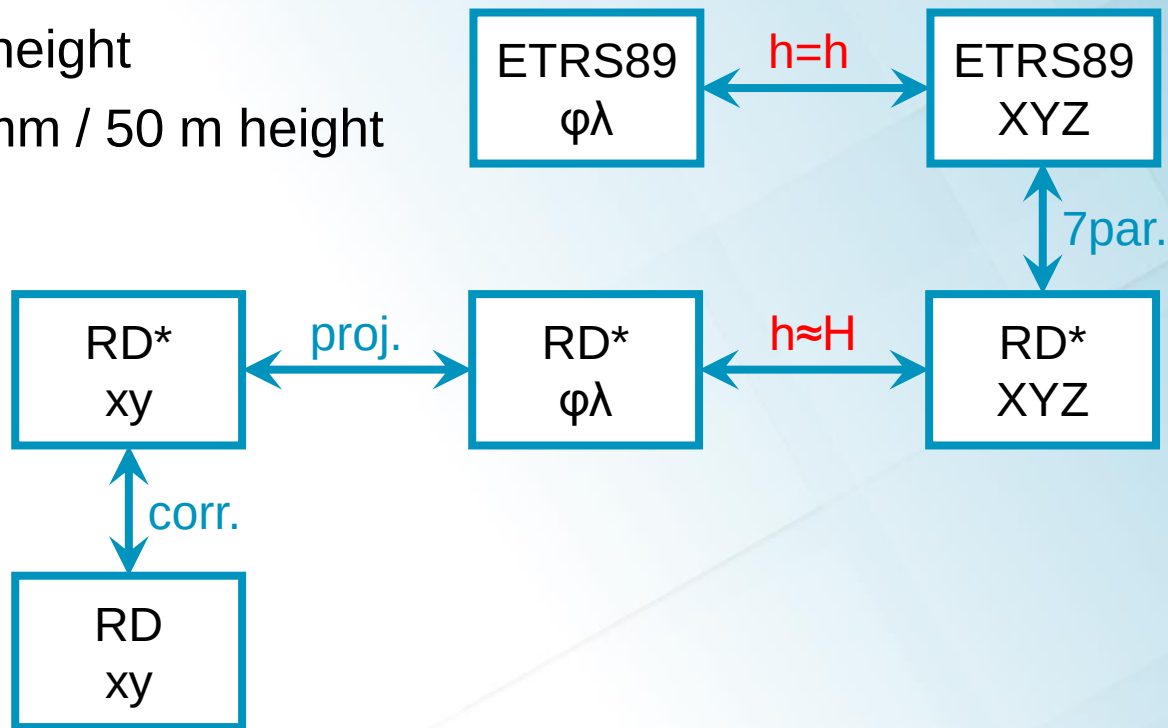
Horizontal at NAP = 350 m



Height dependance

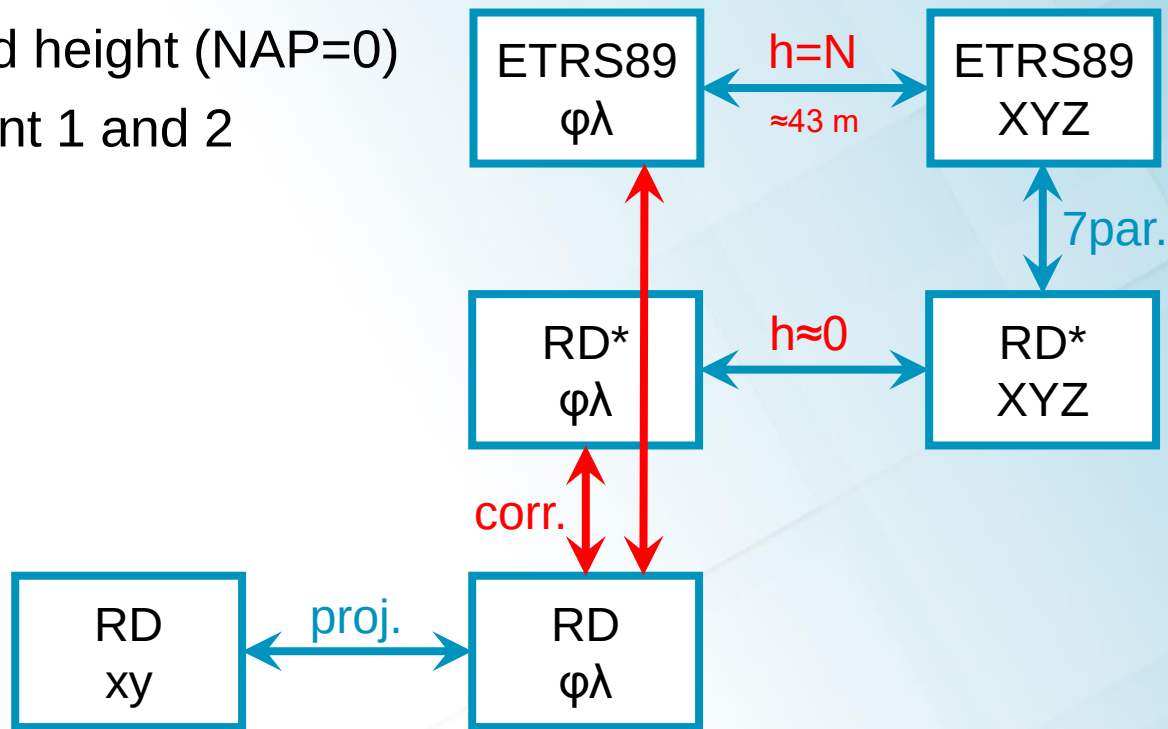
Old procedure: real height

Horizontal effect: 1 mm / 50 m height



Height dependance

New procedure: fixed height (NAP=0)
for same result variant 1 and 2



Conclusion

With a new transformation supported by PROJ.4 ...

... we can continue to use RD as national projection next to ETRS89, ...

... as everyone can transform back and forth without losing accuracy.

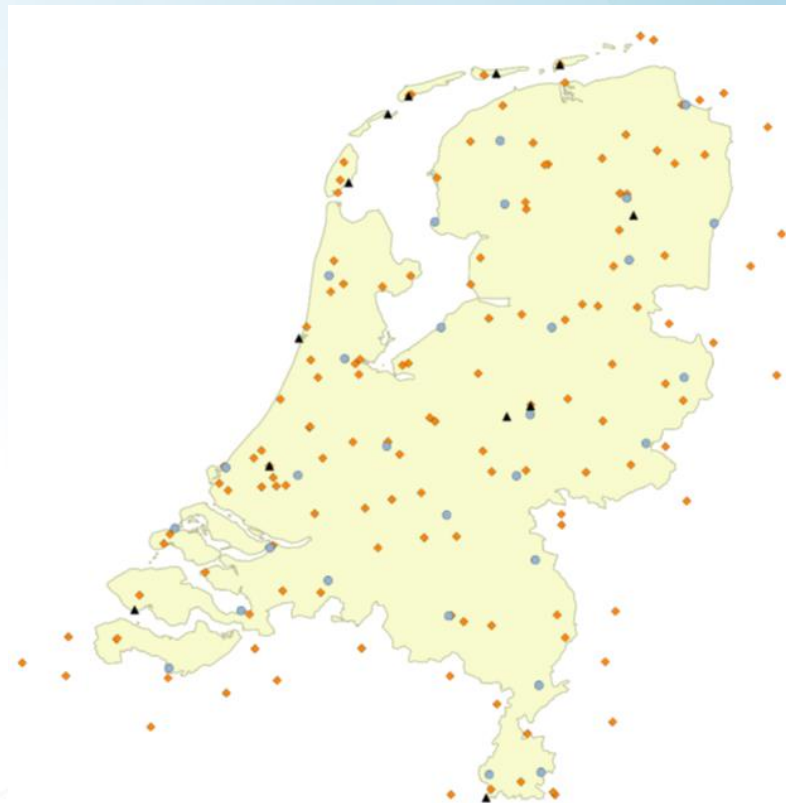
Questions?

email: rd@kadaster.nl

(1) Betere ETRS89-coördinaten

AGRS.NL-stations

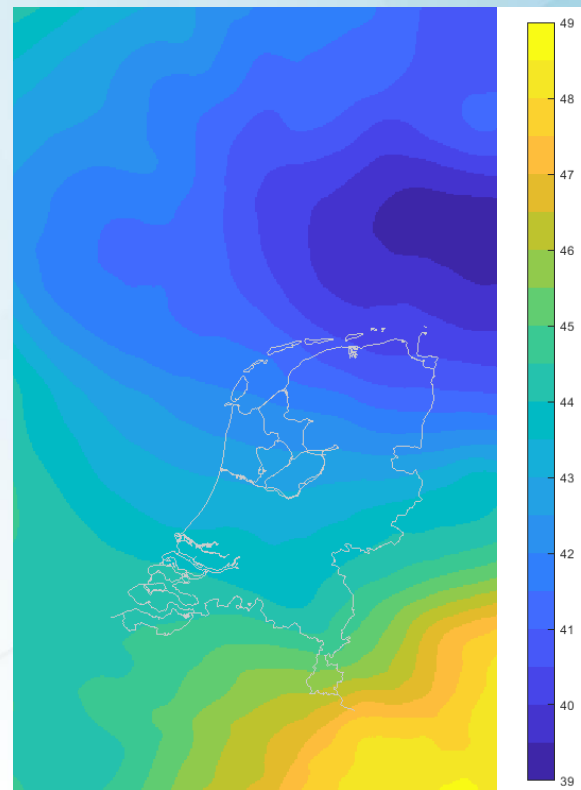
- referentie voor andere GNSS-stations en -kernnet
- betere metingen, antennekalibraties, softwaremodellen enz.



(2) Nieuwe geoïde: NLGEO2018

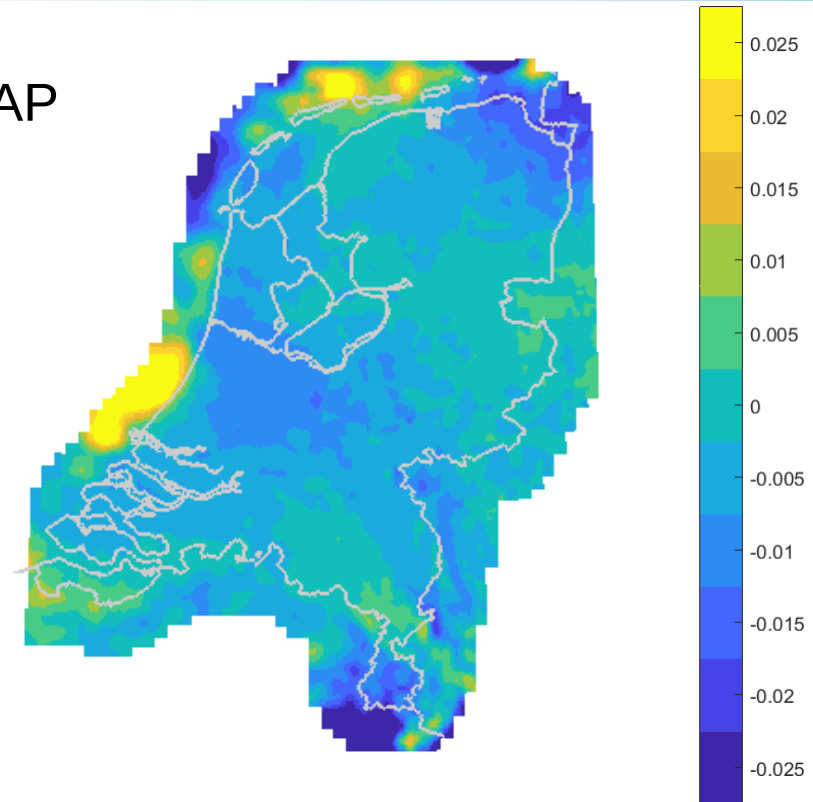
NEVREF-project (TU Delft)

- herberekening GNSS-data
- groter gebied: EEZ
- beter NAP-correctievlak
- hogere resolutie
- incl. LAT



Nieuwe geoïde: NLGEO2018

Verbetering getransformeerd NAP
t.o.v. NLGEO2004
ca. -2,5 tot +2,5 cm



NB: Dia aangepast na presentatie

Oude procedure (RDNAPTRANS™ 2008)

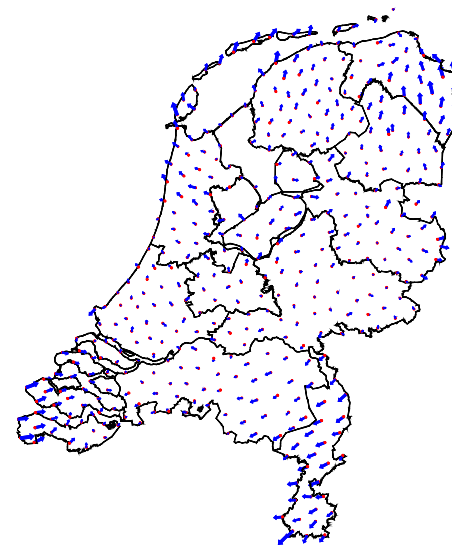
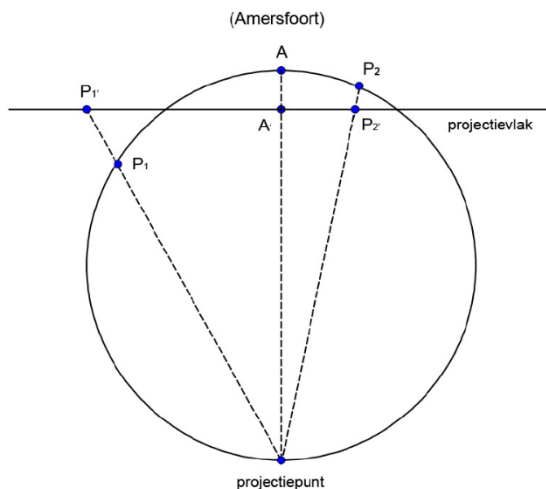
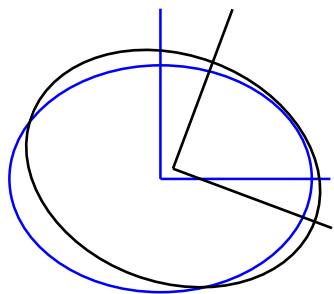
ETRS89

RD

└ datumtransformatie

kaartprojectie

└ correctiegrid



Nieuwe procedure (RDNAPTRANS™ 2018)

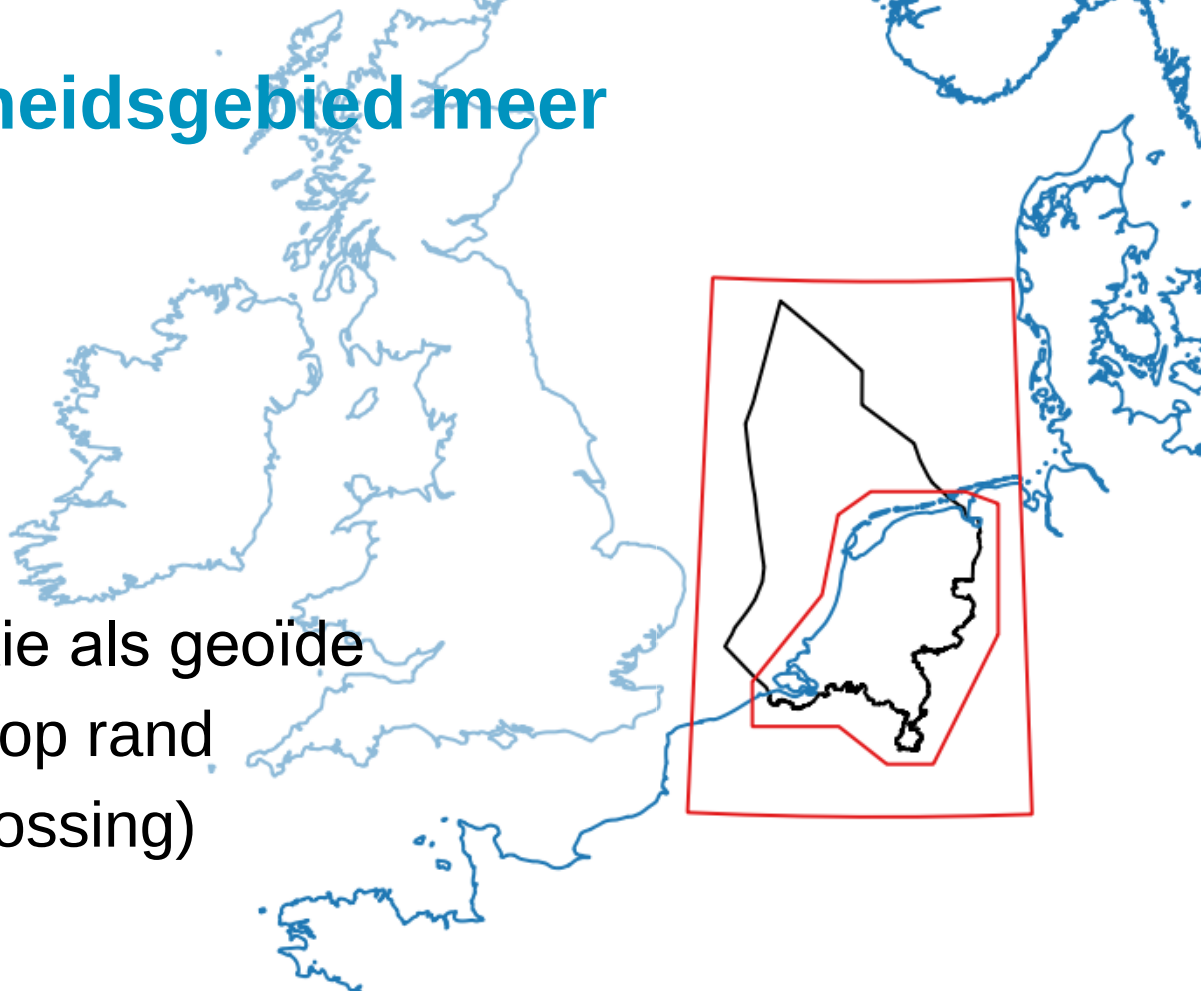


- internationale harmonisatie van procedure (NTv2)

(4) Geen geldigheidsgebied meer

Nieuw grid

- Nederland + EEZ
- zelfde rechthoek, resolutie en bilineaire interpolatie als geoïde
- uitdempen sprong op rand (einde tijdelijke oplossing)



Pas op met RD en NAP buiten Nederland

- vervorming RD-projectie
- geoïde niet gevalideerd

