

Ruimtelijke Informatie

Gastcollege

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vrijdag 25 september 2026

Overzicht

1. Wat is een kaart?
2. De Aarde
3. Geografische coördinaten
4. Geografische projecties
5. Rijksdriehoekscoördinaten (RD)
6. Normaal Amsterdams Peil (NAP)
7. Zelf kaarten maken met EduGIS

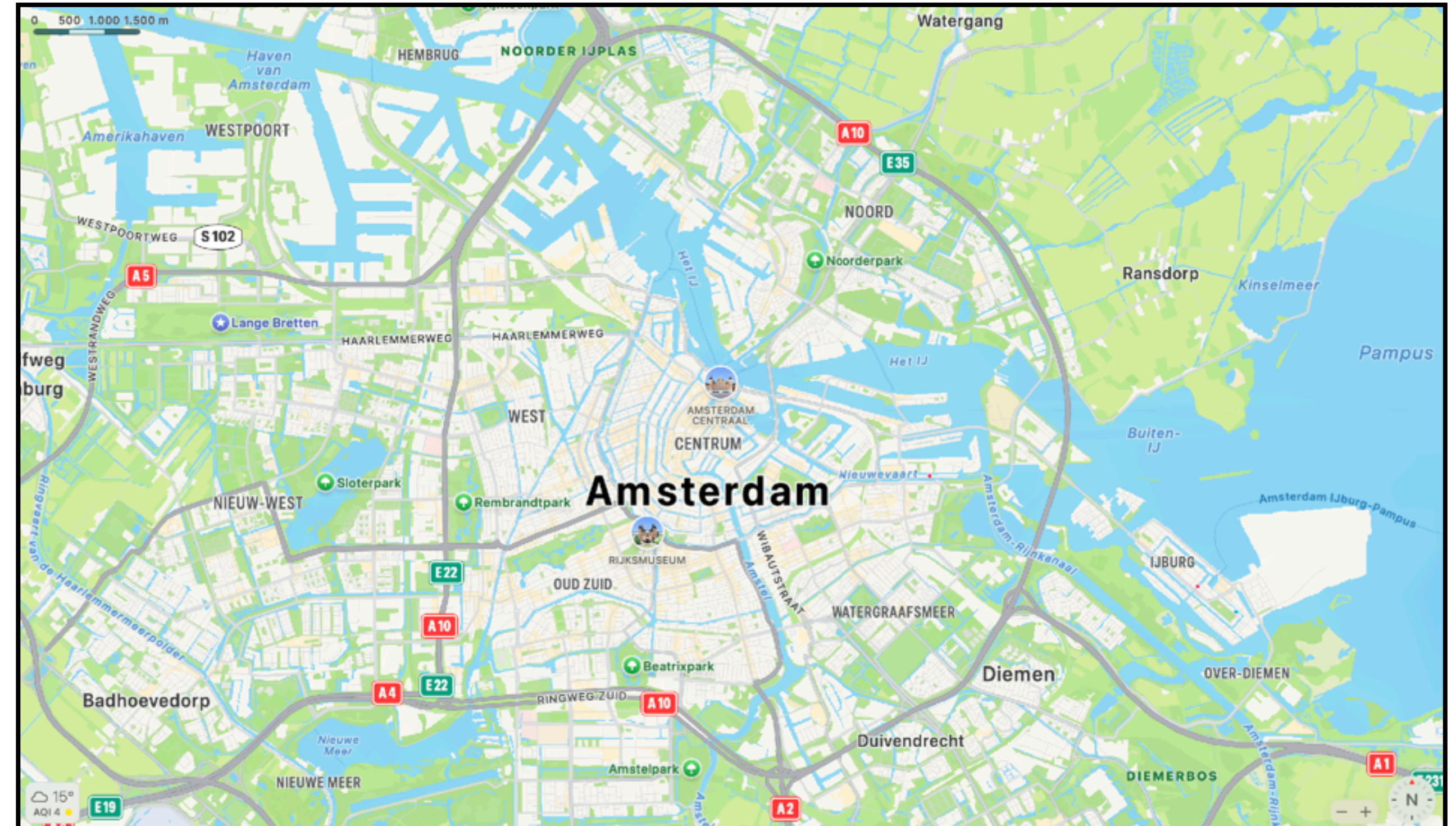
Kernboodschappen

1. kaarten zijn **nuttig** (en mooi)
2. de Aarde is een draaiende afgeplatte **bol**
3. geografische coördinaten zijn een **afsprak**
4. **projectie** van bol naar **platte kaart** kan op eindeloos veel manieren
5. Rijksdriehoekscoördinaten (RD) zijn **eenvoudiger** dan latitude/longitude
6. Normaal Amsterdams Peil (NAP) is hier om de hoek **geboren**
7. Kaarten maken met **EduGIS** is toch best makkelijk

Kaarten



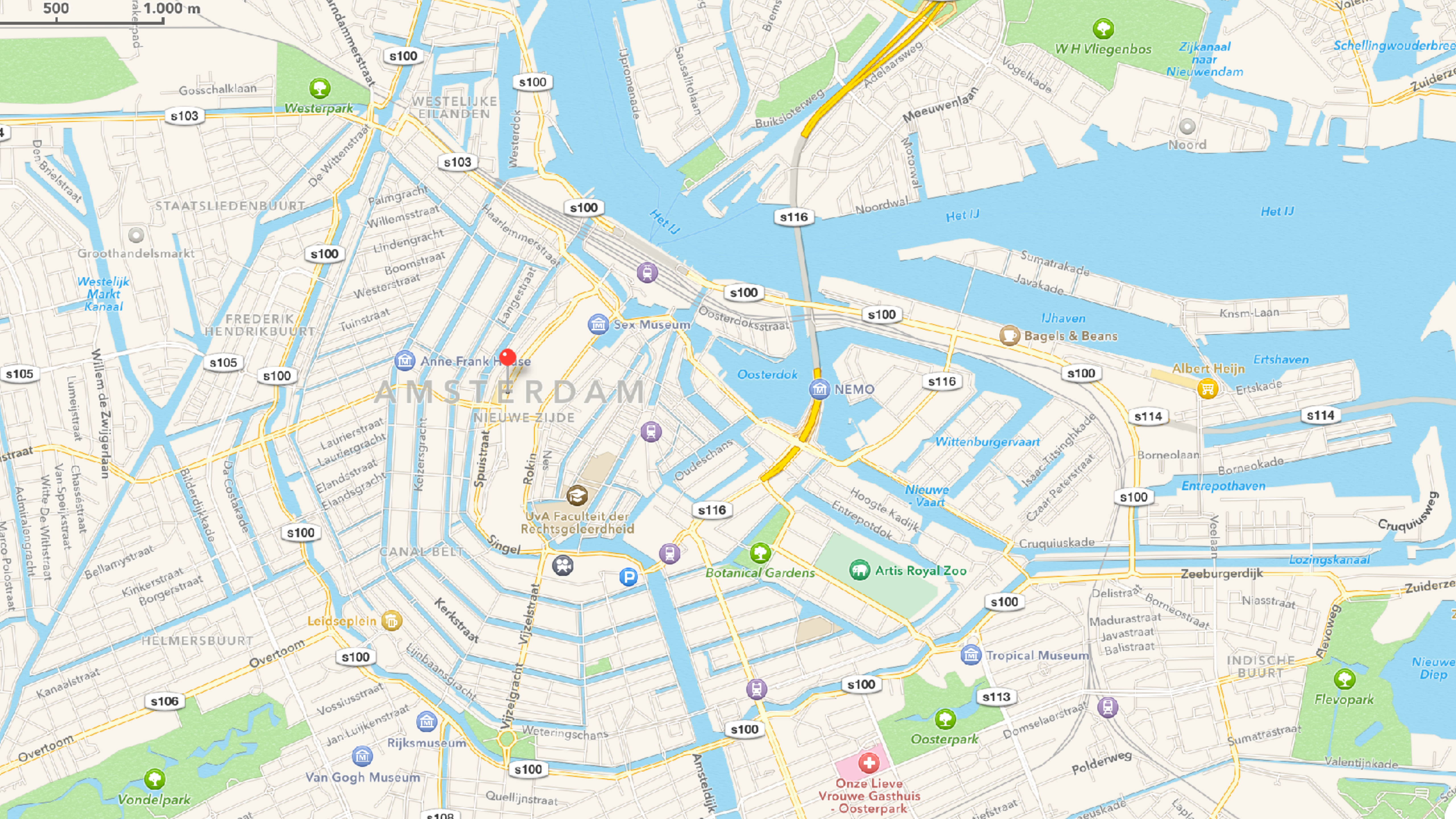
Ptolemaeus, 150 AD



Apple Maps, 2026

Ptolemaeus, *Geographia* (150 AD)







Een Argentijnse hostelbezoeker verlaat de stad voor een feestje in **Ruigoord**.

Vijf van de dertig groepen, allemaal gasten van het Mövenpick, stapten in een rondvaartboot. Die vaart verschillende routes, maar allemaal pakten ze **dit stukje** IJ mee.

film museum.

Deze drukte maar vormde samen met The Flying Pig **de meetpunten**. Dit geeft dus een vertekenend beeld.

De **Dam** wordt door deze toeristen iedere dag gemiddeld **3,84 keer** overgestoken.

Ook het winkelgebied van **de 9 straatjes** weet een aantal toeristen te vinden.

Mövenpick Hotel

The Flying Pig

Anne Frank Huis

De Dam

De Wallen

Scheepvaartmuseum

AMSTERDAM

Rembrandtplein

Leidseplein

Museumplein

Heineken Experience

Twee groepjes toeristen stapten in een **Hop-on, Hop-off**-bus, de rode dubbeldekker die door de stad rijdt en stopt bij attracties.

Twee Canadese backpackers **braden fietsen**

AMSTERDAM



Leidseplein

Rembrandtplein

Museumplein

Heineken Experience

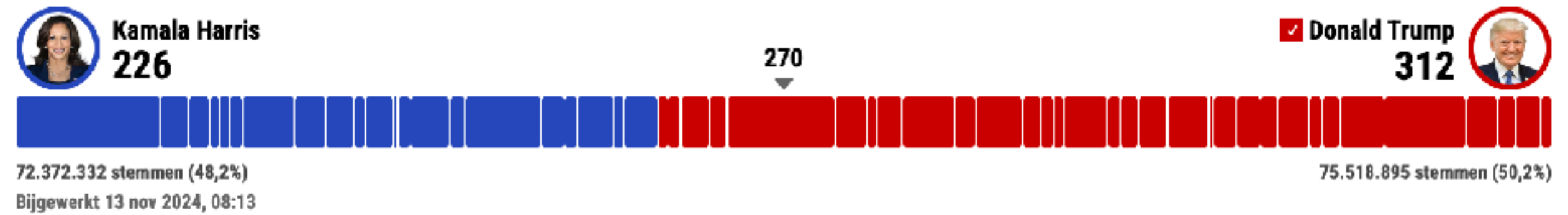
Amstel

Twee groepjes toeristen stapten in een **Hop-on, Hop-off-**bus, de rode dubbeldekker die door de stad rijdt en stopt bij attracties.

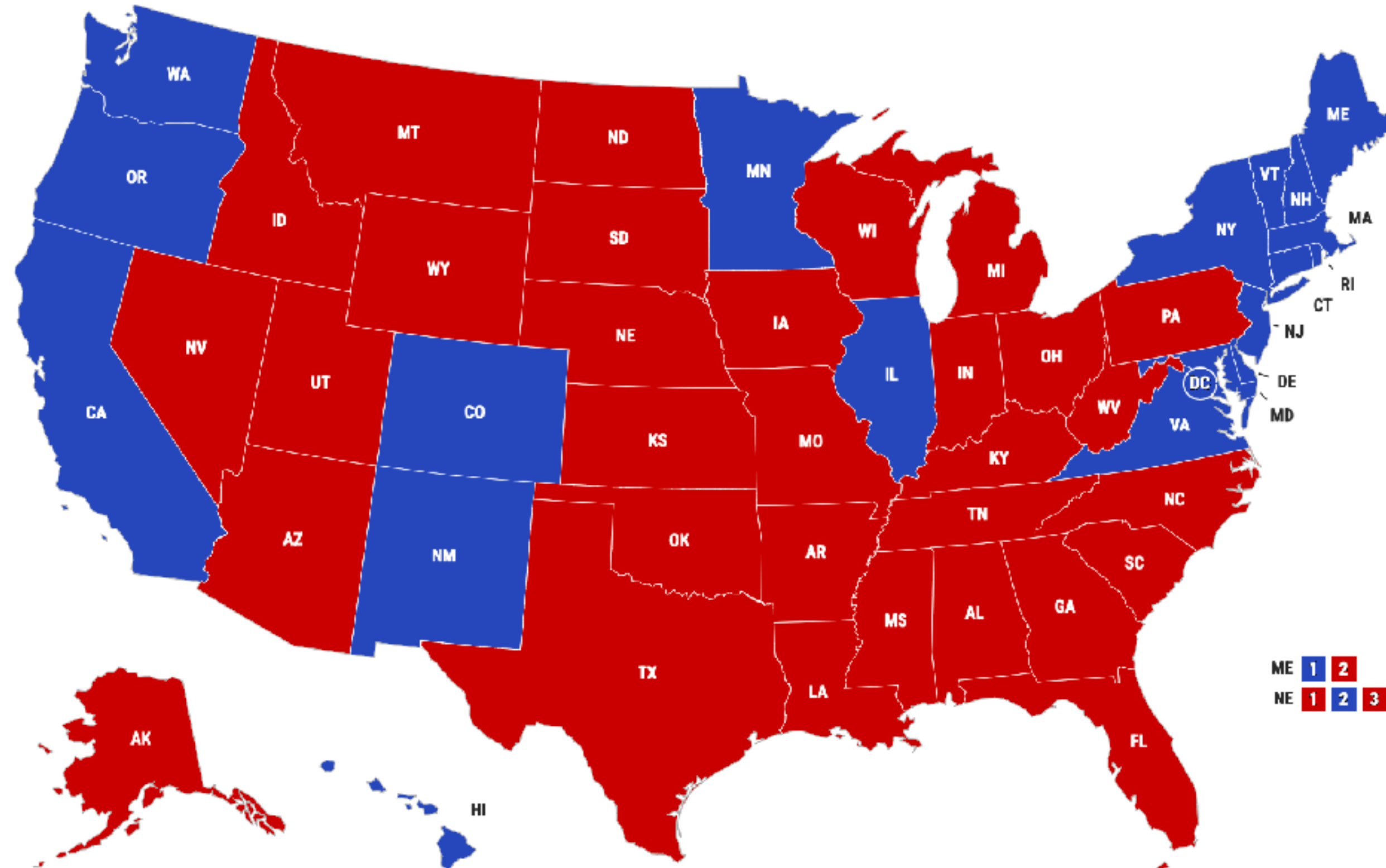
Twee Canadese backpackers **huurden fietsen** en besloten - na een rit door het Vondelpark - richting Oudekerk aan de Amstel te fietsen.

200 m

Verkiezingen

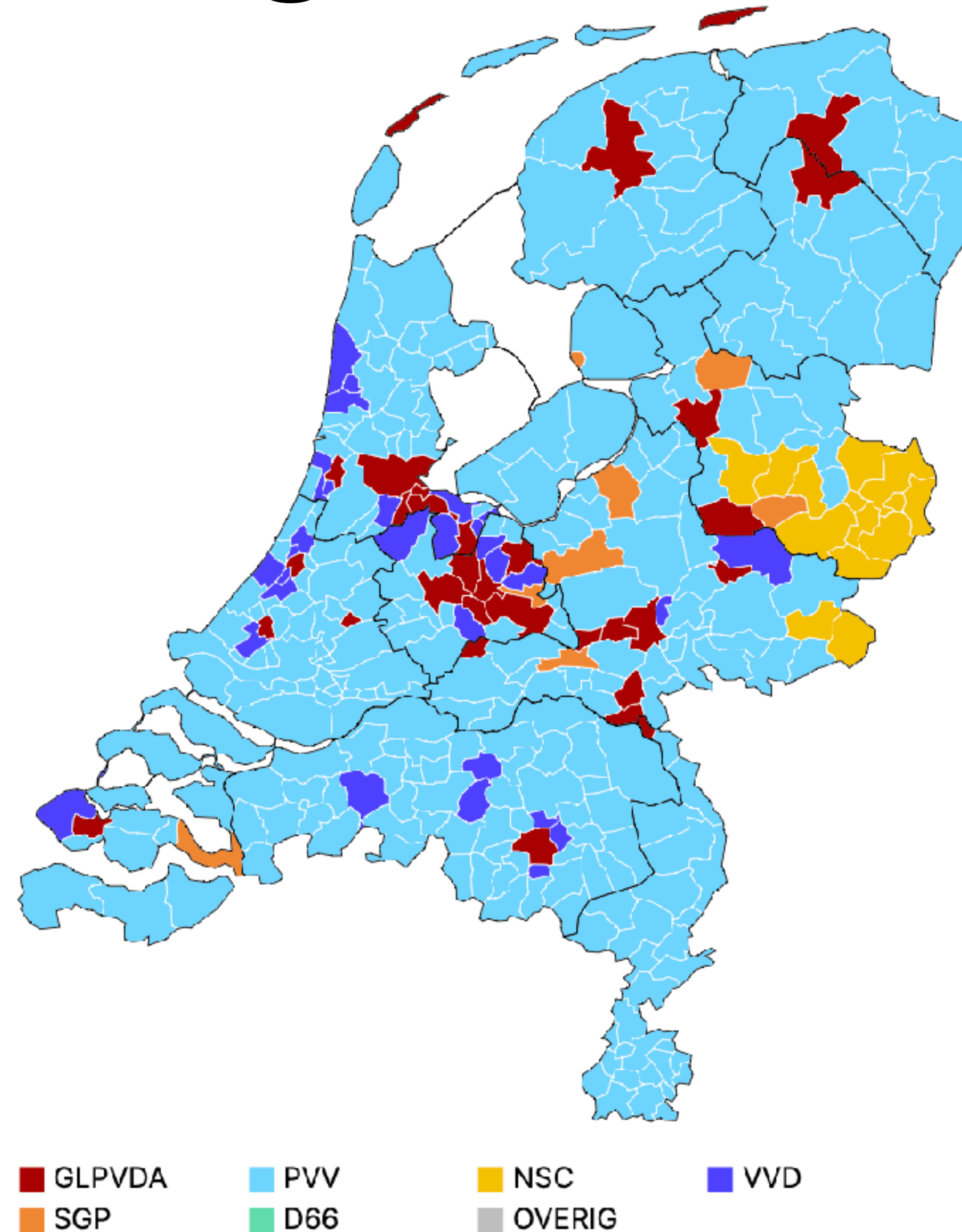


- VS van A
- president
- november 2024



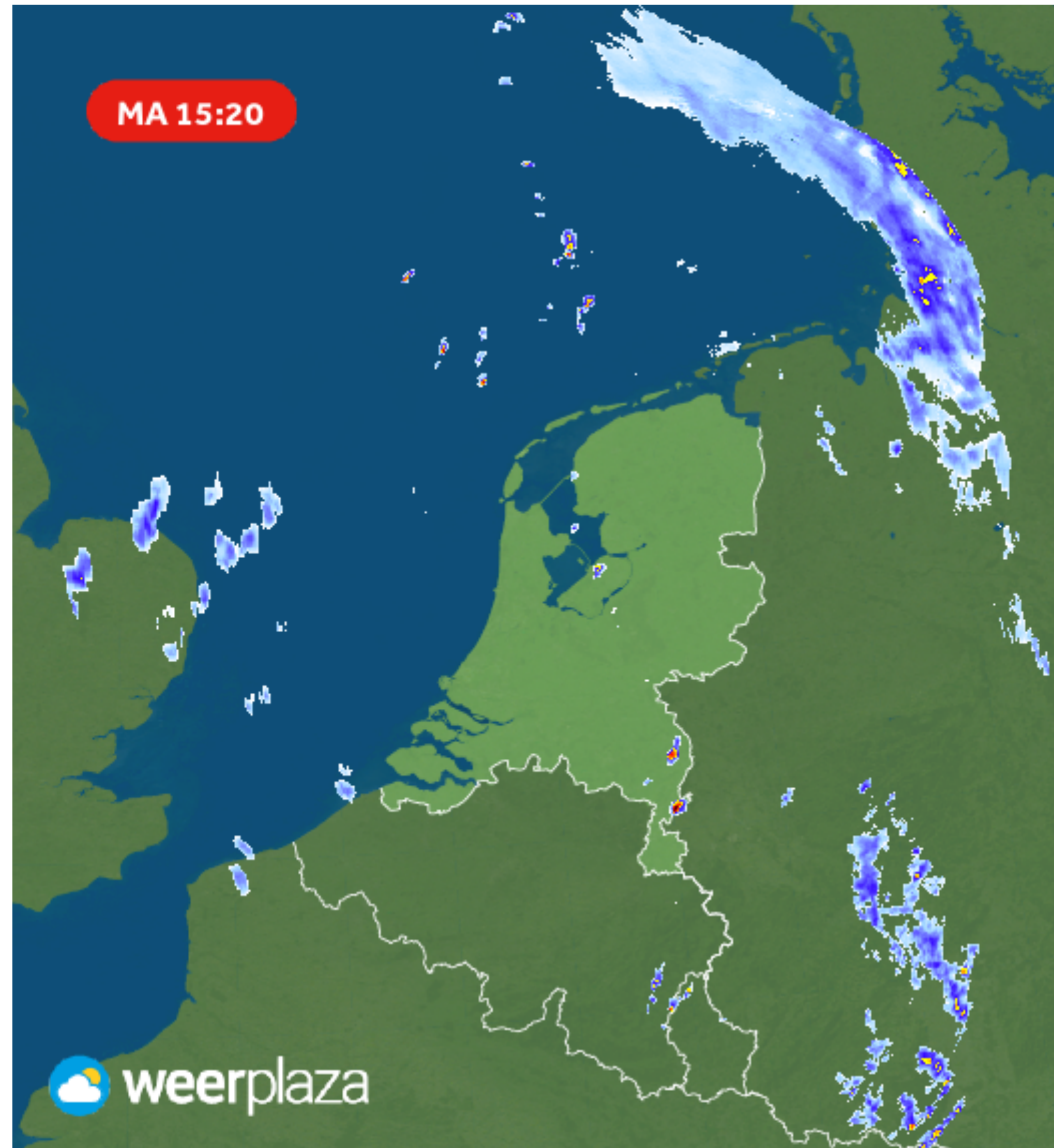
Verkiezingen

- Nederland
- 2de Kamer
- november 2023



Weer

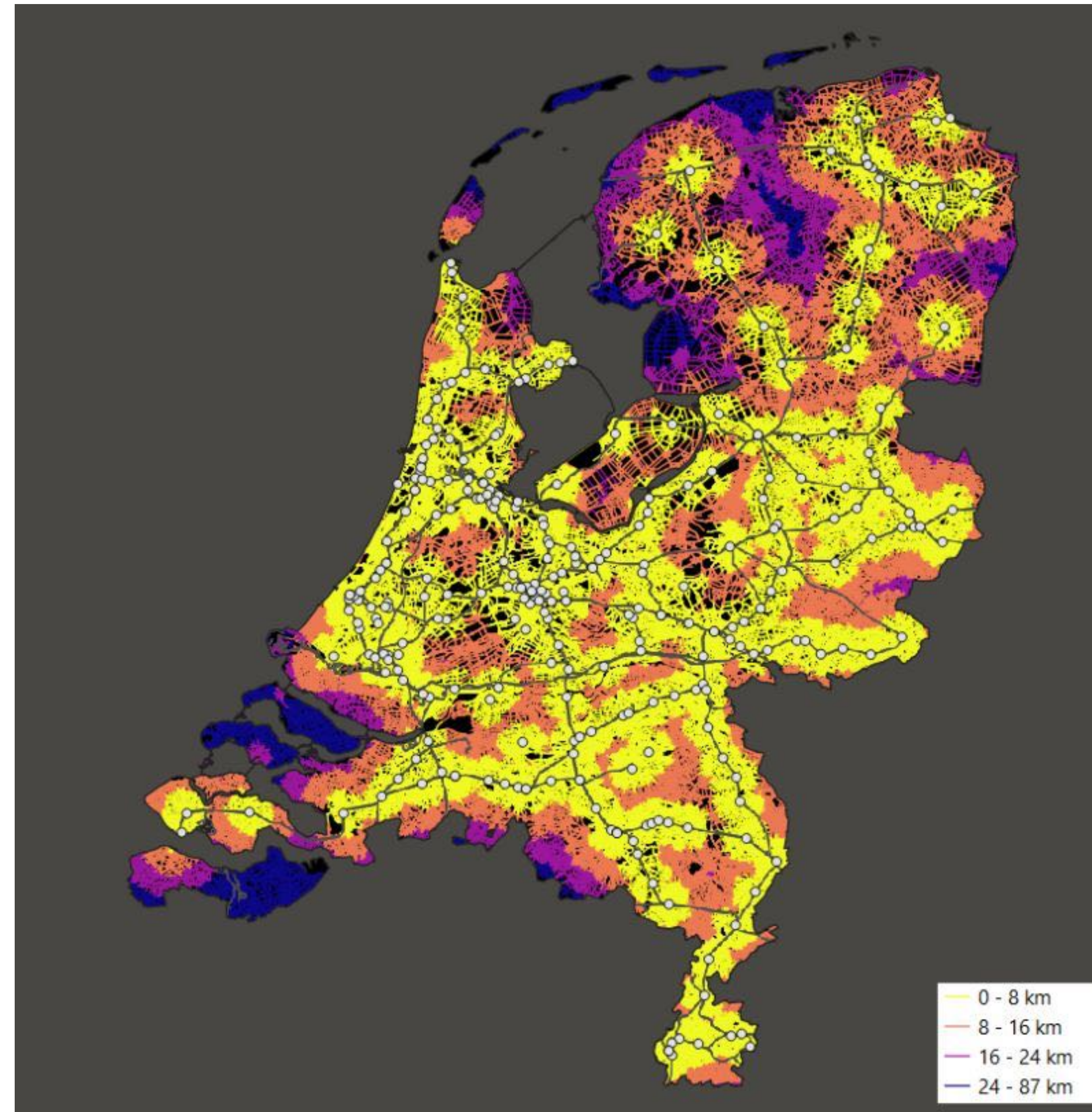
- Nederland
- 1 september 2025



OV-fiets



- afstand tot dichtstbijzijnde OV punt



0 - 8 km
8 - 16 km
16 - 24 km
24 - 87 km

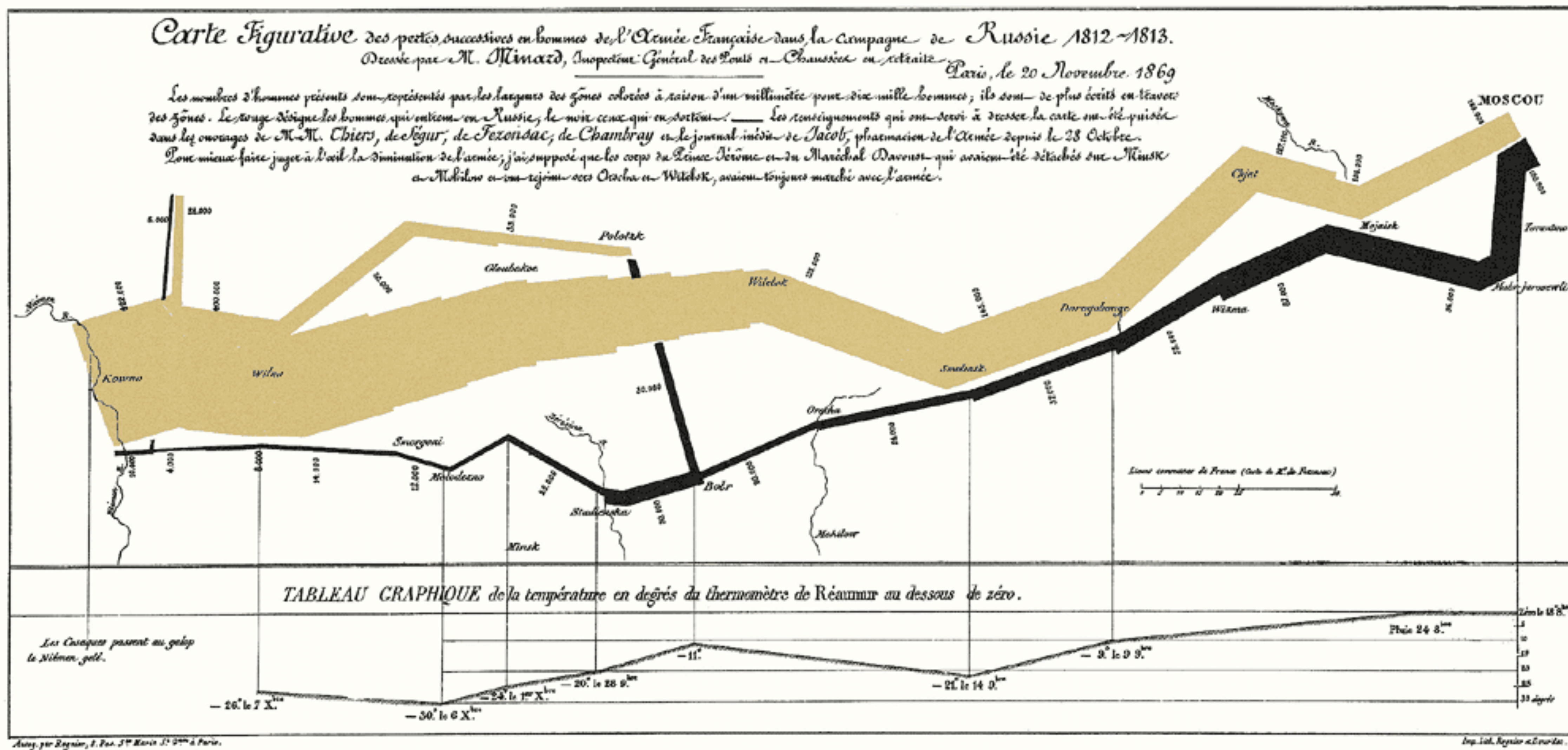
Napoleon's leger in Rusland

- De verliezen van het leger van Napoleon tijdens de Russische campagne van 1812-1813.



- Edward Tufte, “data visualisatie guru”
 - <https://www.edwardtufte.com/product/napoleons-march/>

Napoleon's leger in Rusland

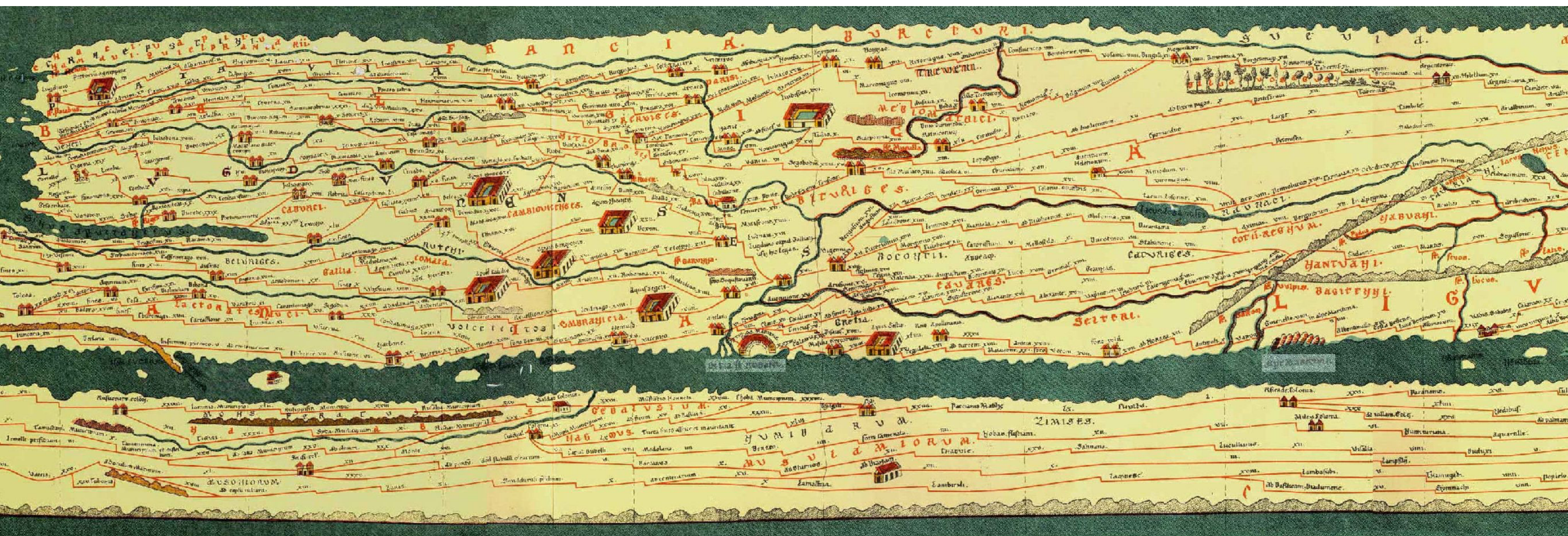


<https://www.romeinen.nl/weten/limes>



- Tabula Peutingeriana
(Latijn 'De Peutinger kaart')
- oorsprong onduidelijk
- Forum Hadriani
 - Voorburg
- Noviomagus
 - Nijmegen







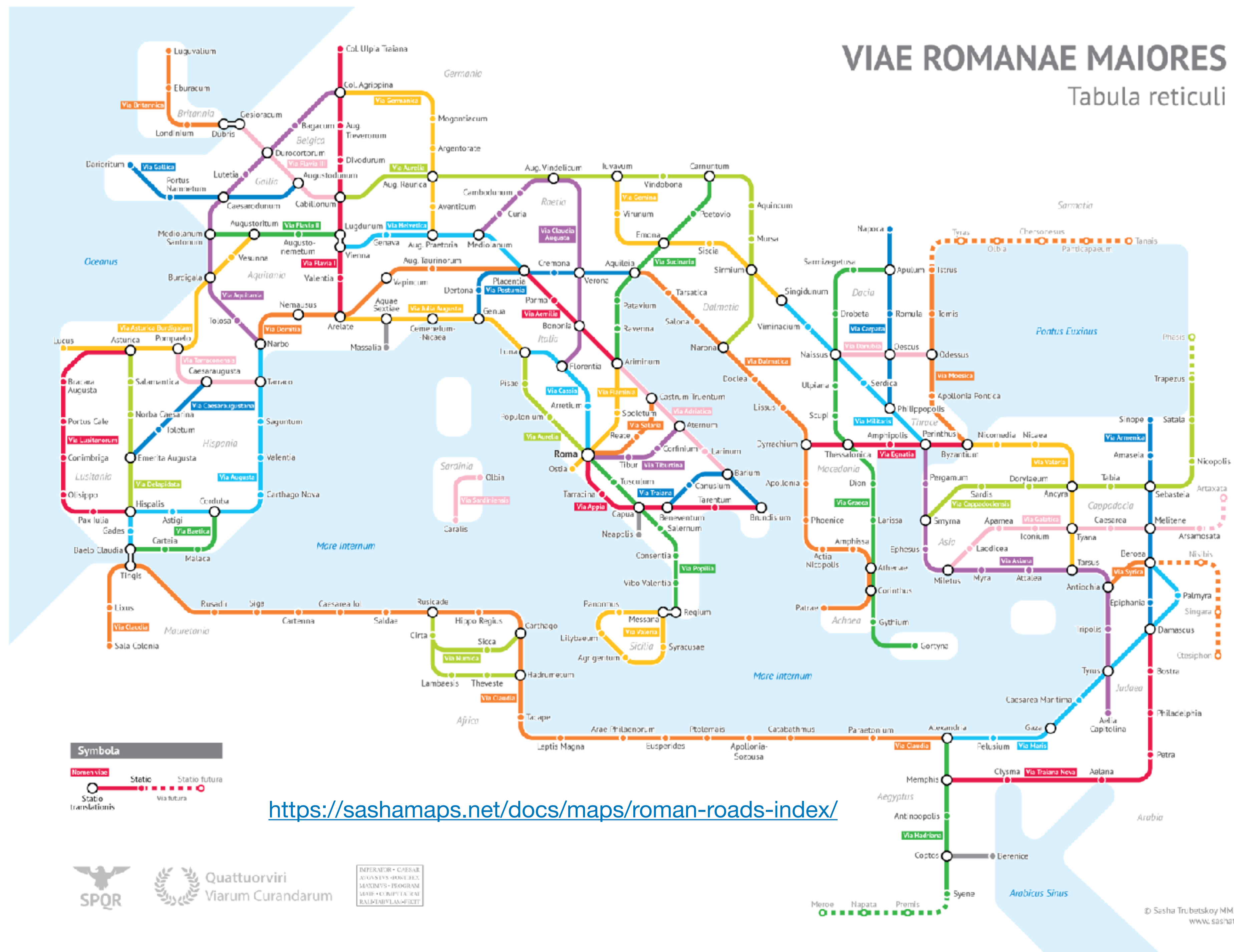


Tube map - Autumn 2024



VIAE ROMANAE MAIORES

Tabula reticuli



© Sasha Trubetskoy MMXVII
www.sashat.me



Waar worden kaarten voor gebruikt?

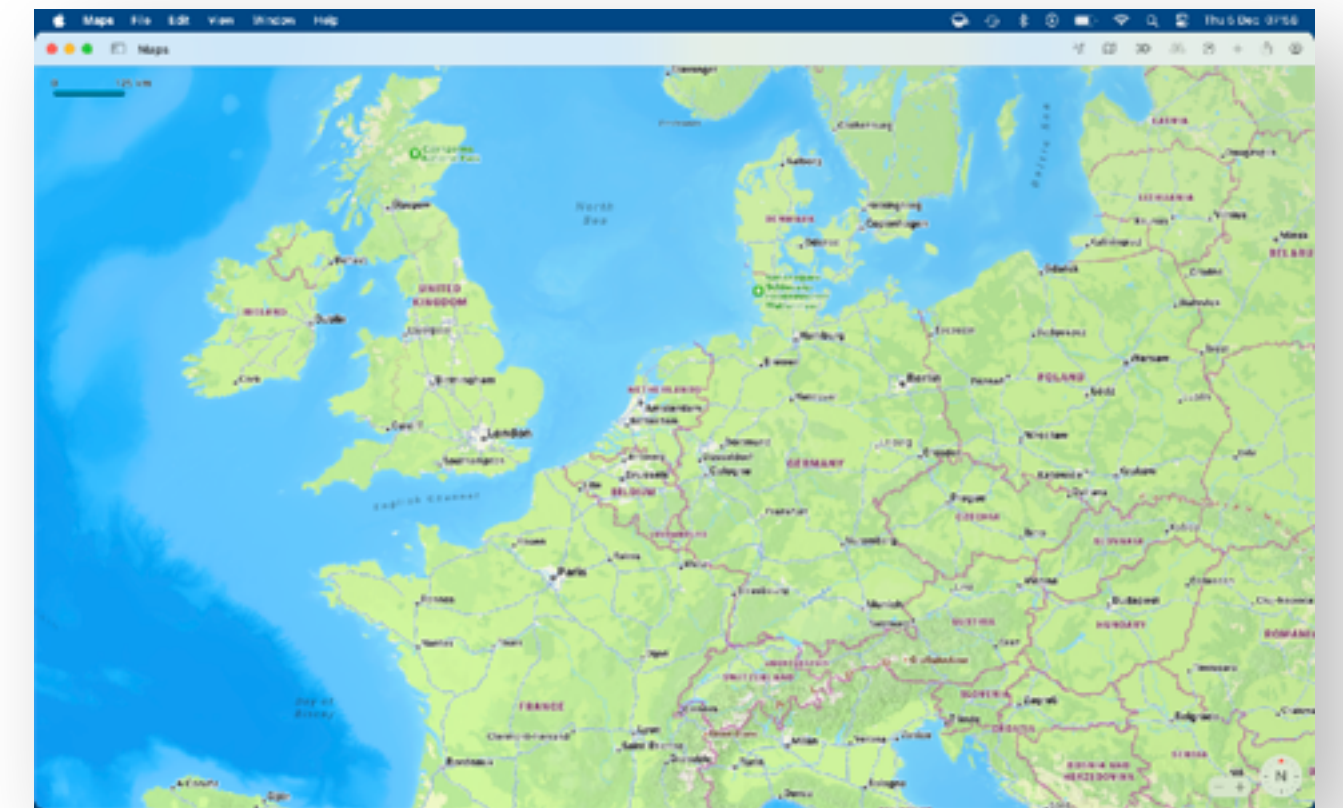
- navigatie → van A naar B (connecties belangrijker dan afstanden & richtingen)
- algemene referentie → wereld, continenten, landen, steden
- topografisch → Aarde, land / water, hoogte / diepte,
- thematisch → bv. populatiedichtheid, mediaan inkomen, enz.
- kadastrale kaarten → eigenaarschap
- schoonheid → kaarten zijn mooi

Demo

- verschillende websites met kaarten
 - maps.google.com
 - maps.bing.com
 - maps.apple.com
 - openstreetmap.org

Kaarten gebruiken

- Google Maps → goed voor navigatie
- Apple Maps → goed voor esthetisch genoeg
- Open Street Maps → meest nauwkeurig / up-to-date



Vorm van de Aarde



Eerste foto van de Aarde

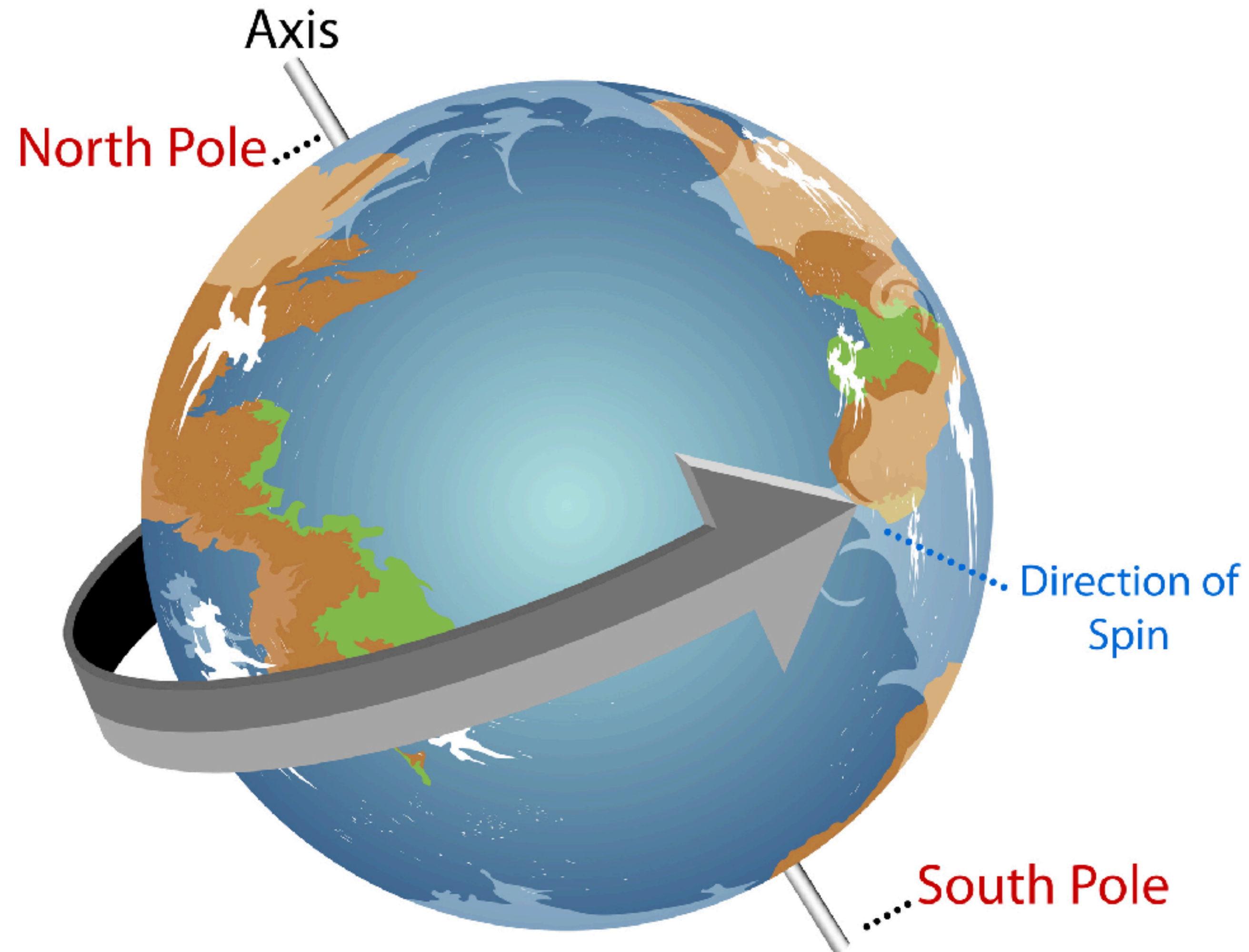
- 1ste foto van de Aarde vanuit de ruimte, waarschijnlijk door astronaut William Anders
- 21 december 1968



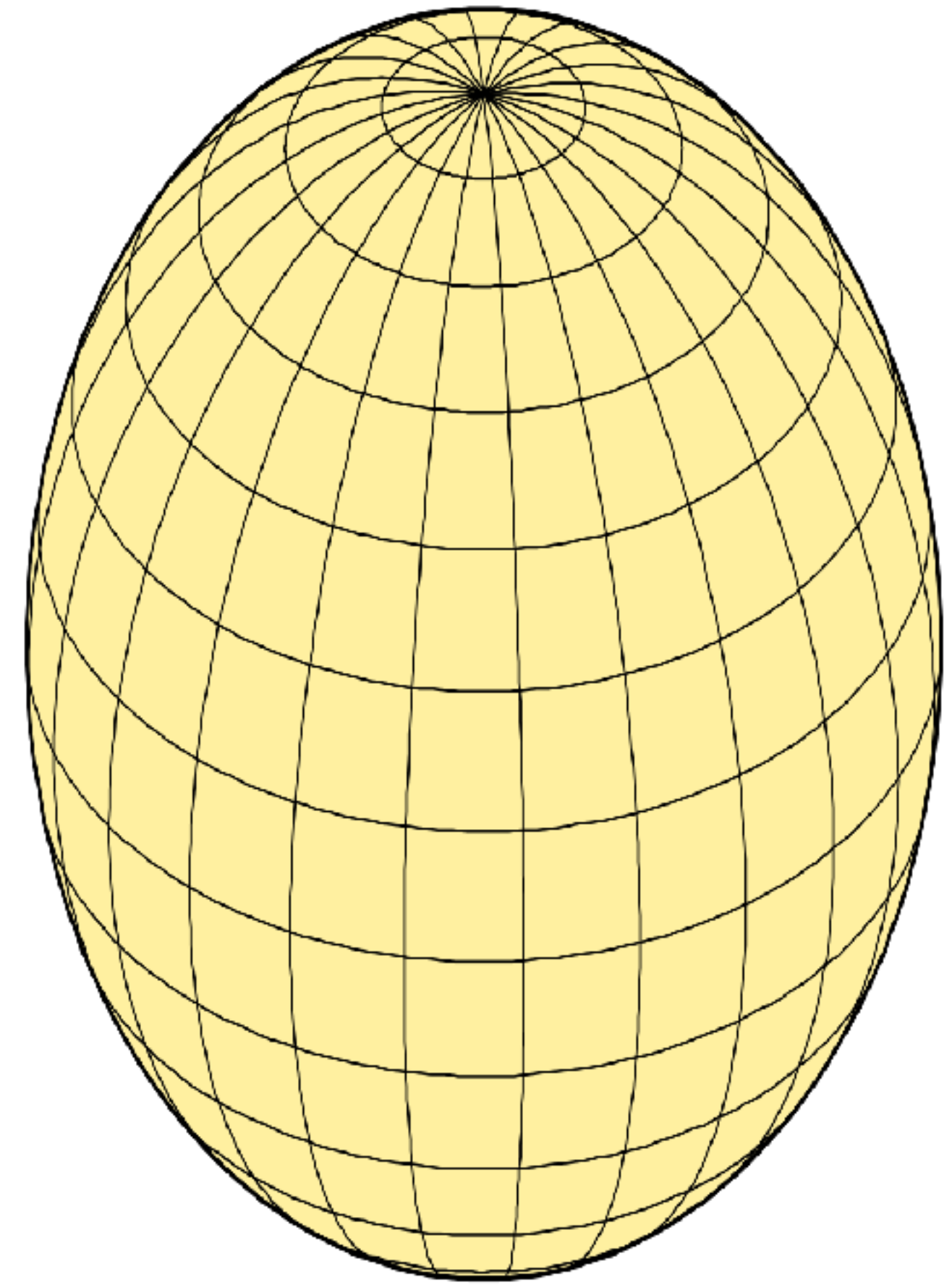
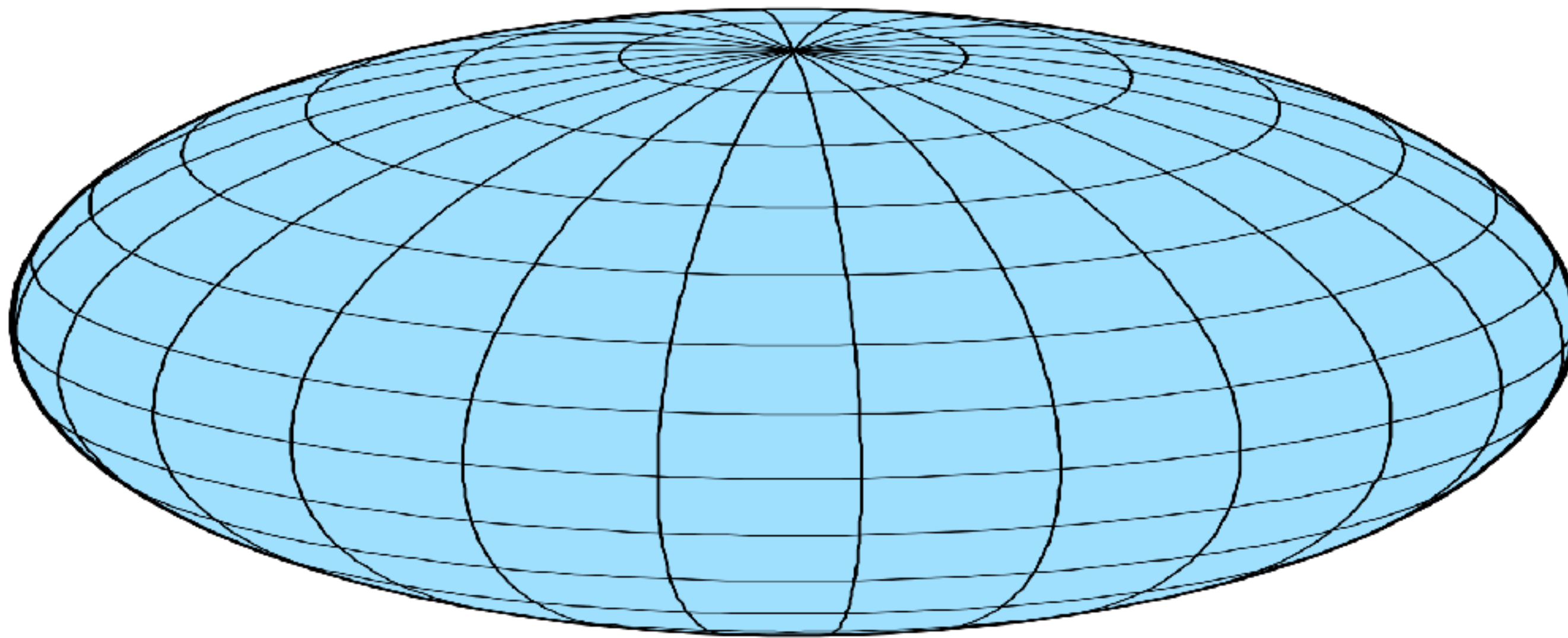
De Aarde draait



De Aarde draait



Afgeplatte of uitgerekte bol?



Welke is correct?



Afgeplatte bol



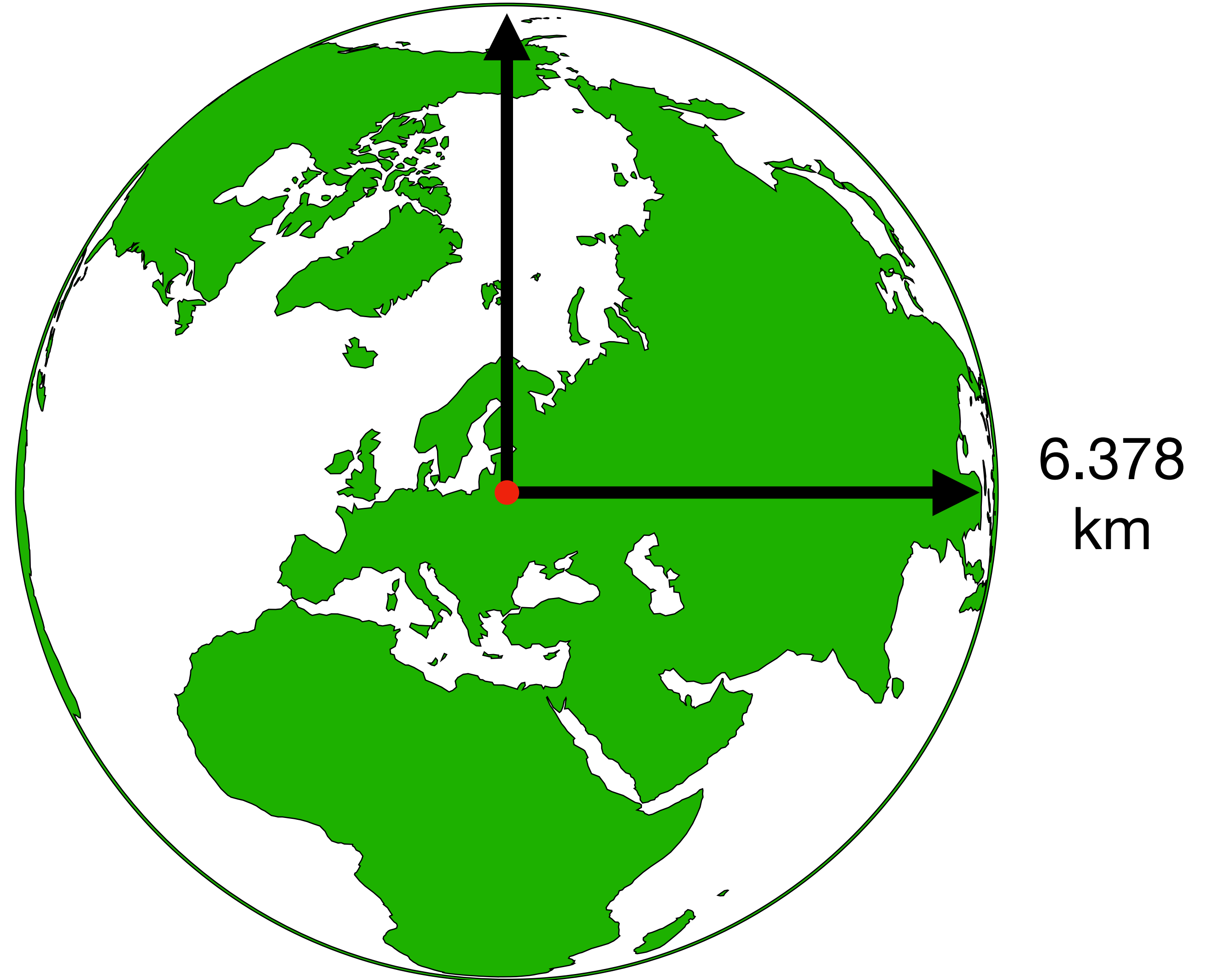
Oblate sferoïde



Groen

6.357 km (-0.3 %)

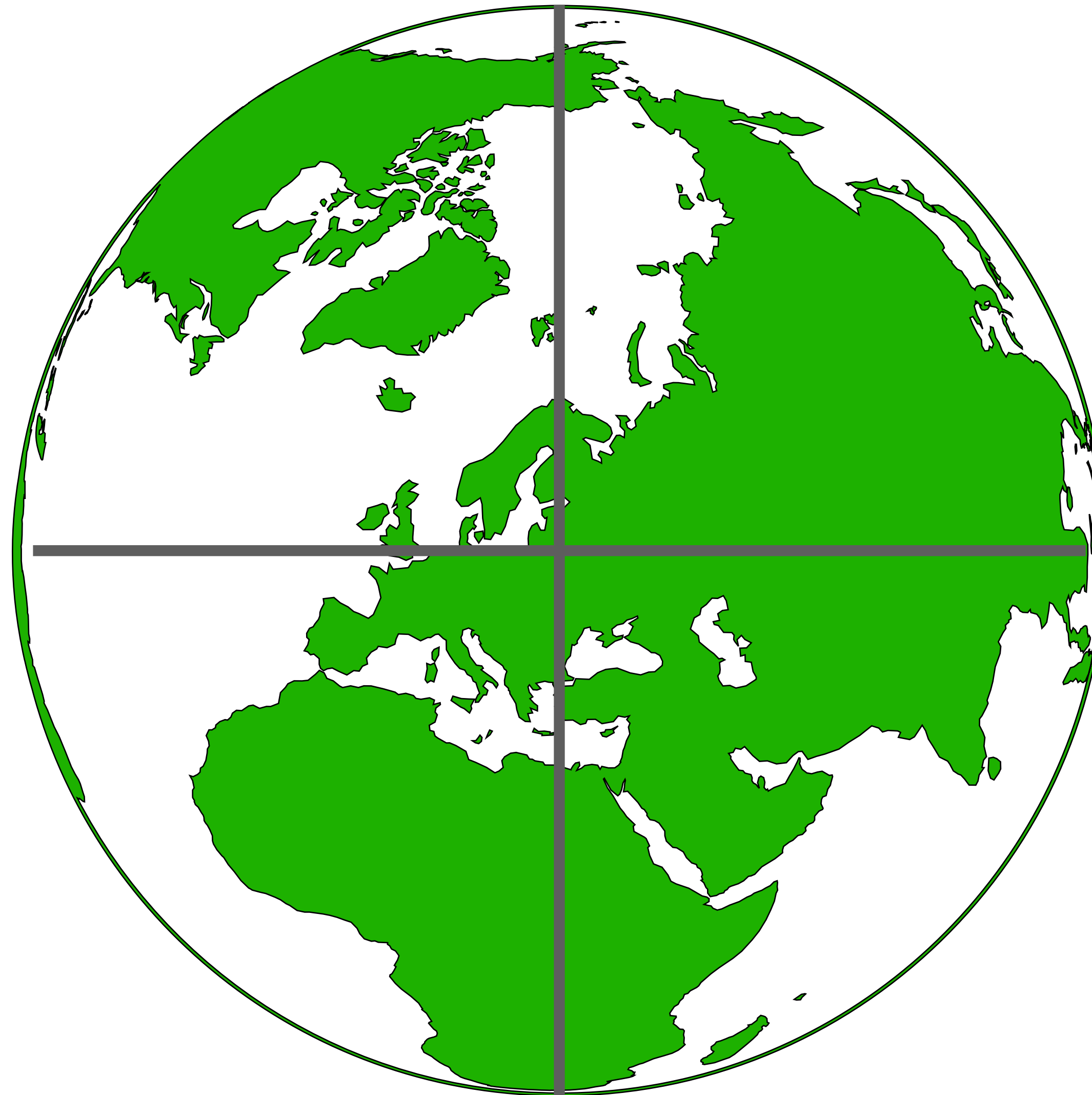
- straal naar de polen
 - 6.357 km
- straal bij de evenaar
 - 6.378 km



Oblate sferoïde

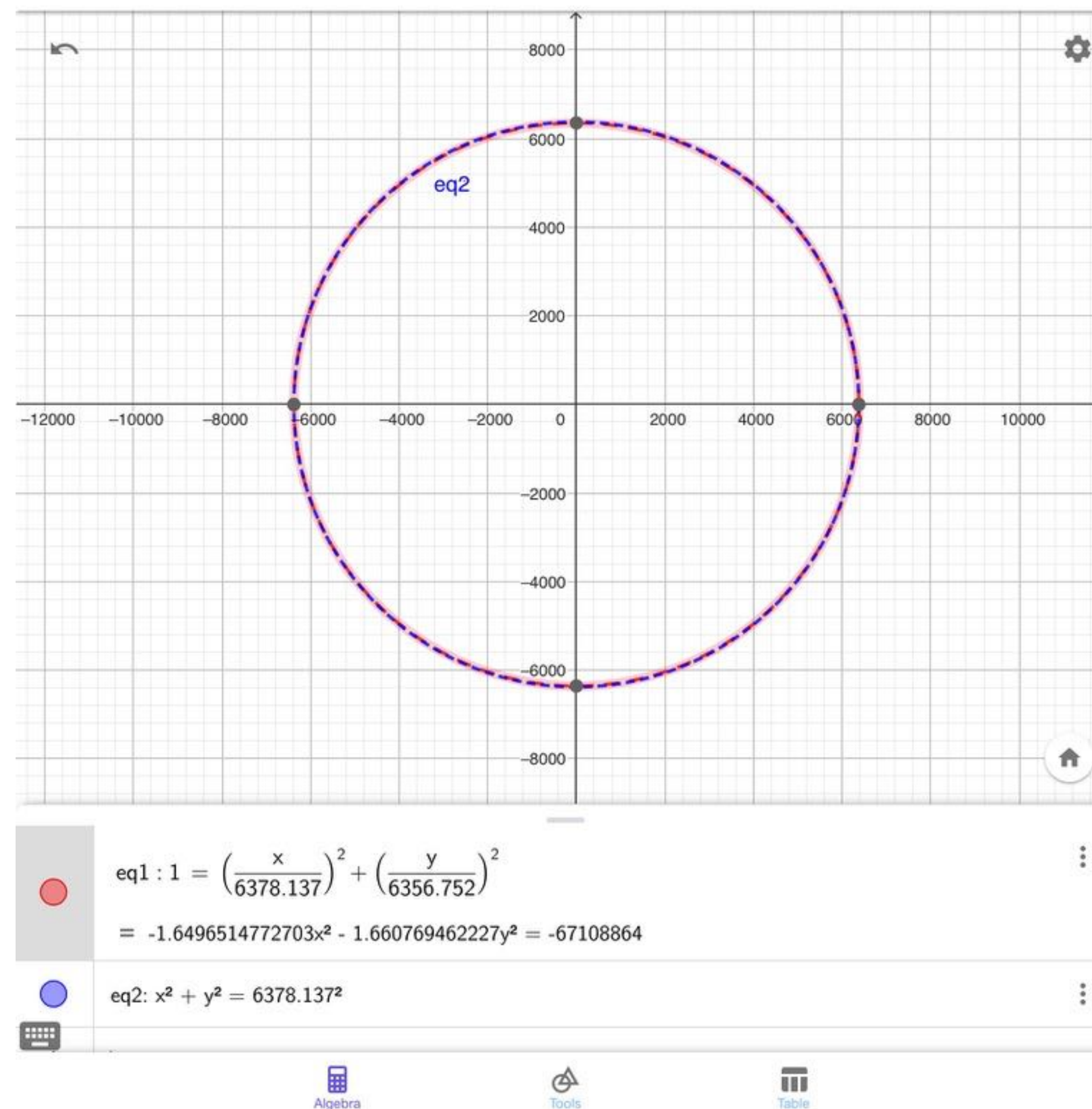
40.008 km

$$\begin{array}{l} \text{omtrek} \\ = \\ 2 \pi \times \text{straal} \end{array}$$



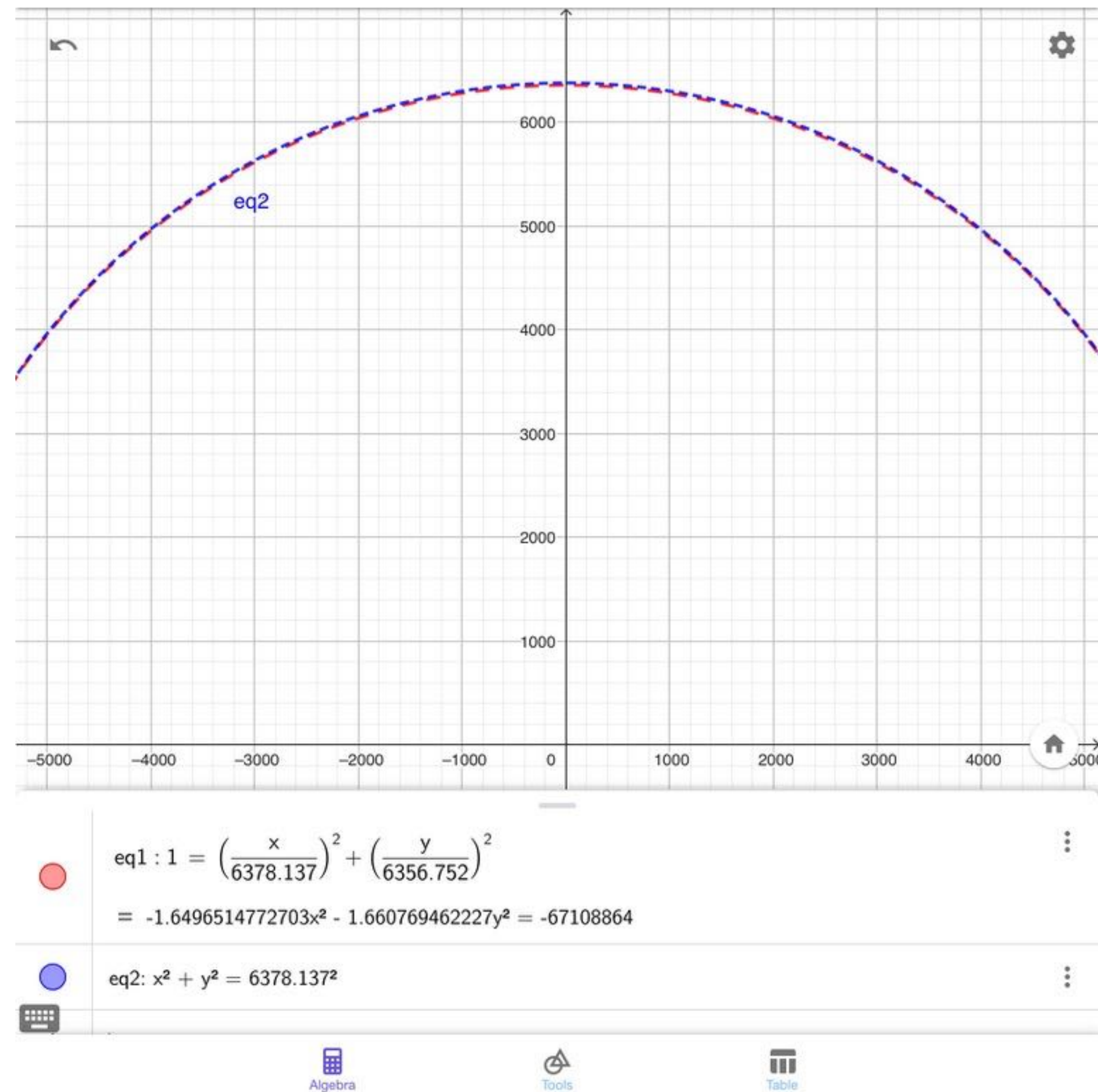
40.075 km

Oblate sferoïde

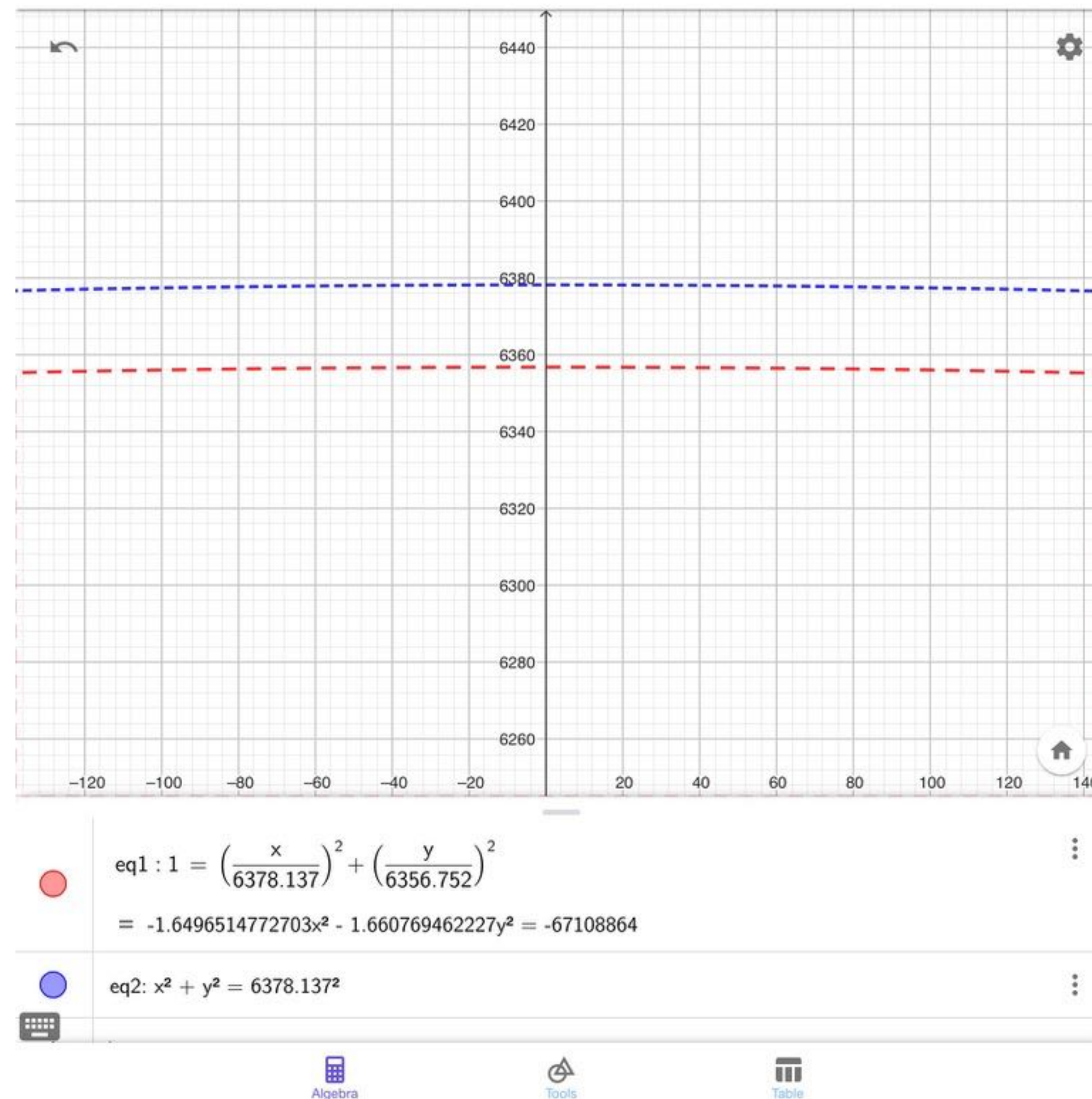


[GeoGebra.org](https://www.geogebra.org)

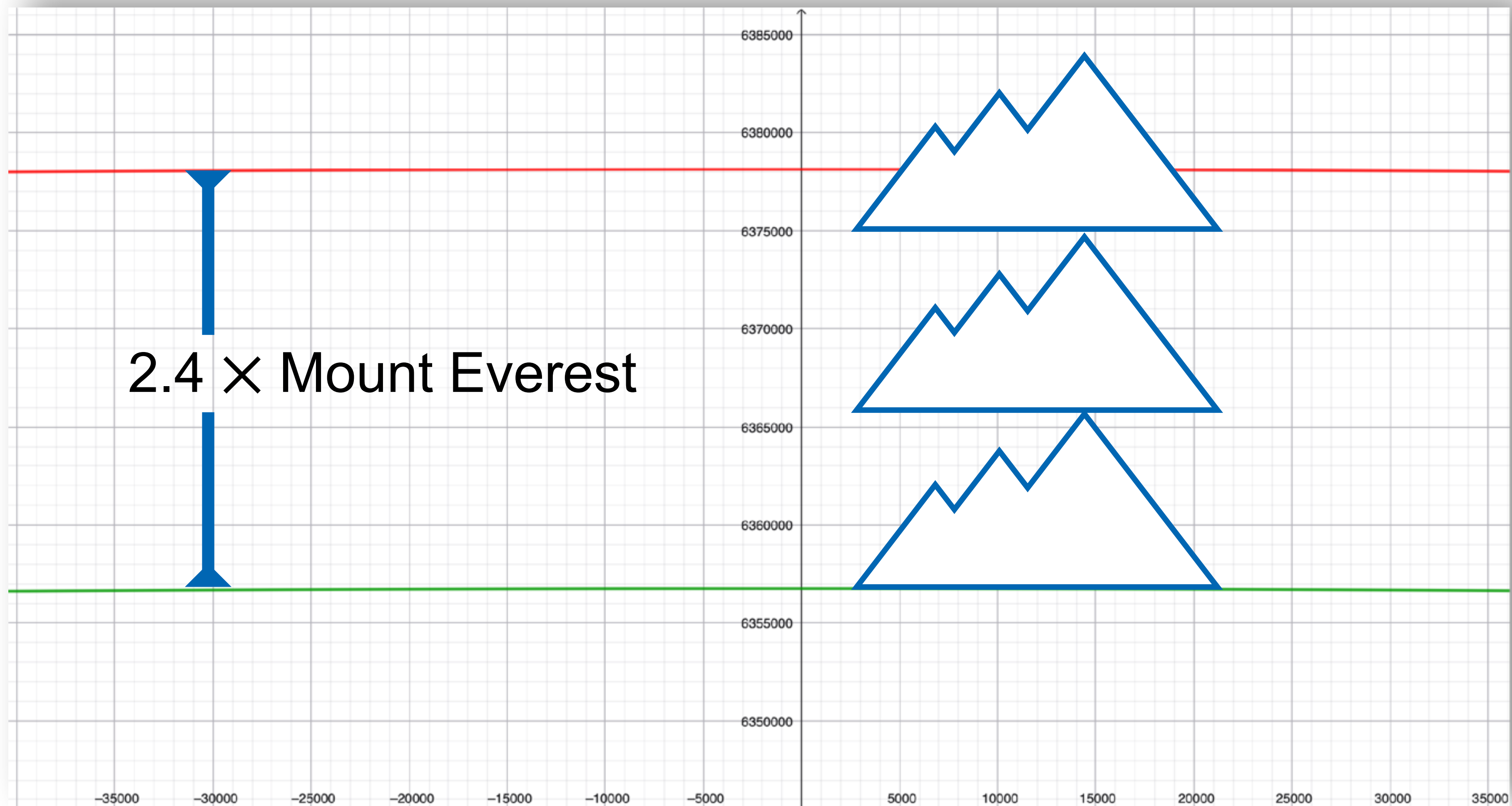
Oblate sferoïde



Oblate sferoïde



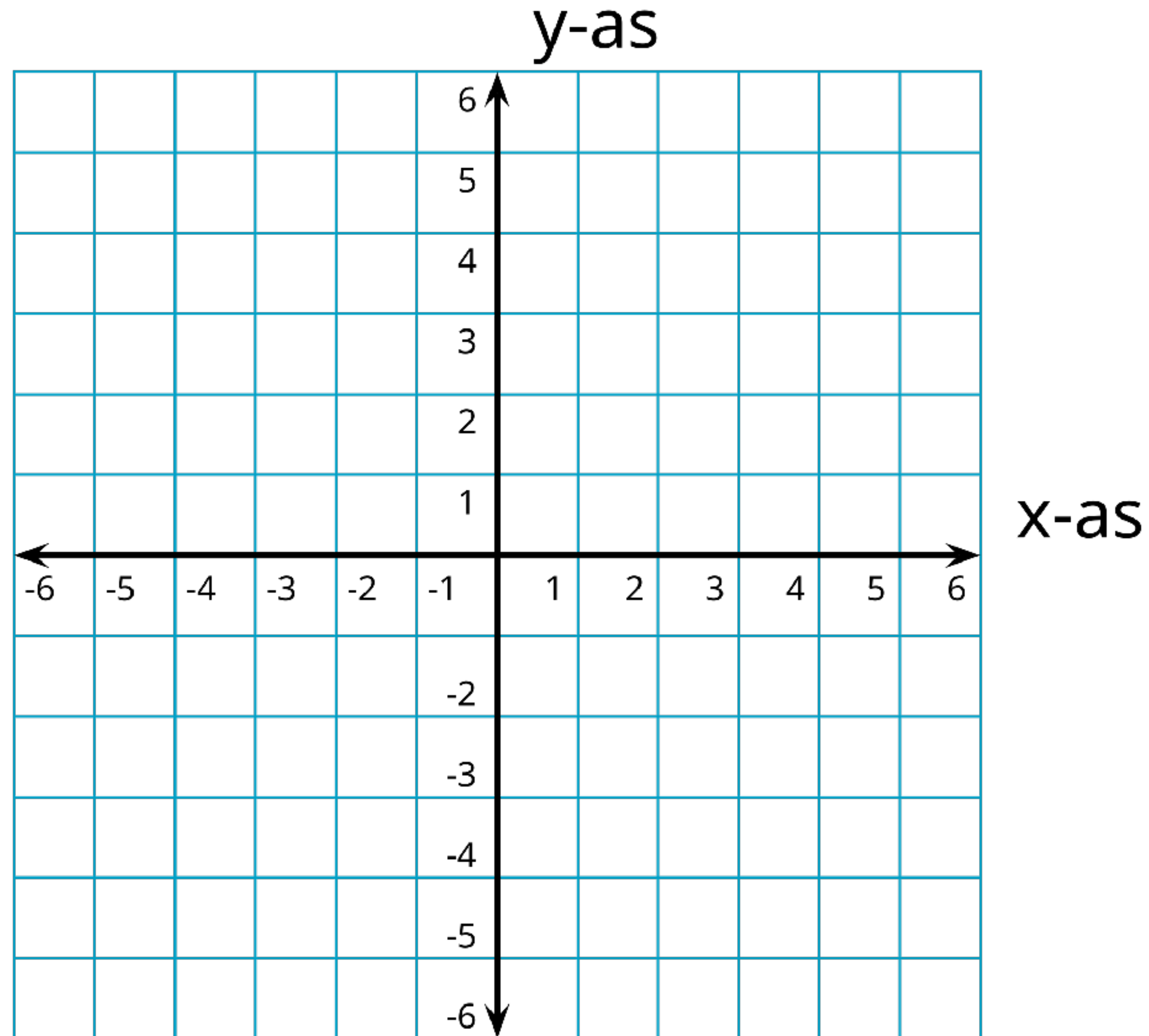
Oblate sferoïde



Geografische coördinaten



Cartesische coördinaten



Ptolemaeus, *Geographia* (150 AD)



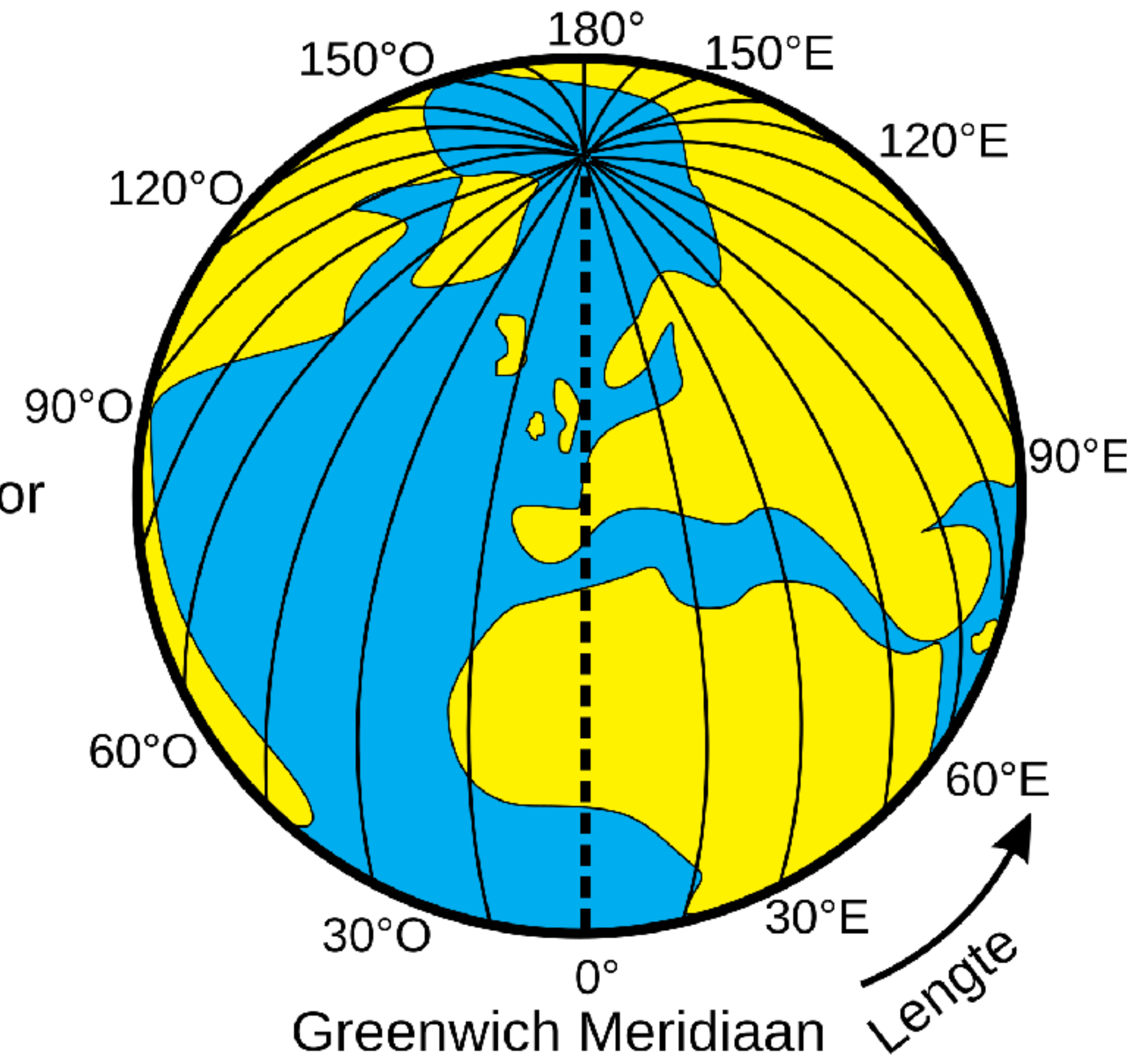
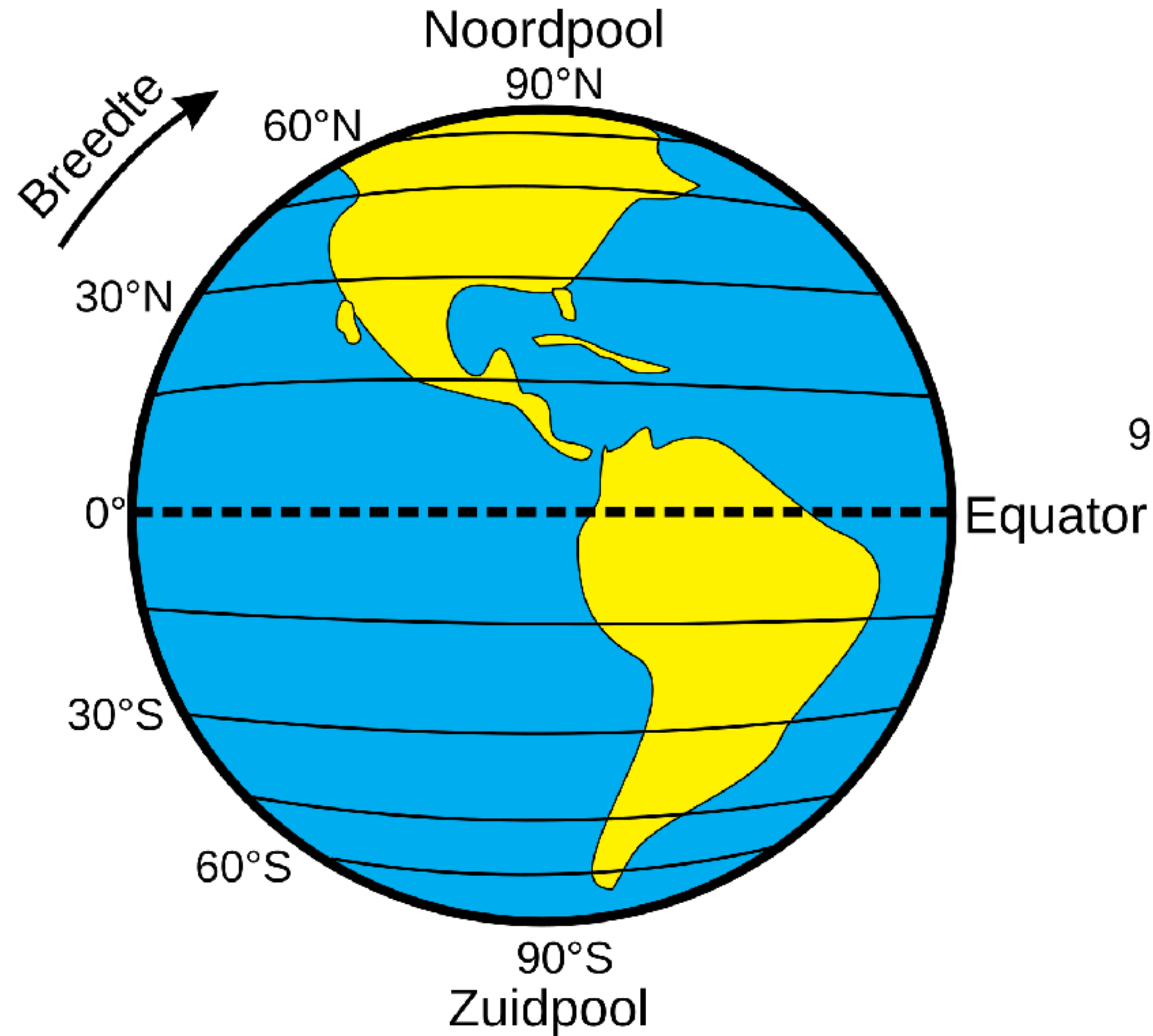
Ptolemaeus, *Geographia* (150 AD)

- eerste boek / kaart met geografische coördinaten
- Thony Christie (wetenschapshistoricus)



- “Ptolemaeus to whom we owe our longitude and latitude coordinate system, although he had predecessors in antiquity, used the Azores as his zero meridian although he didn’t know with any real accuracy where exactly the Azores lay.”
- <https://thonyc.wordpress.com/2017/05/04/one-line-to-rule-them-all/>

Geografische coördinaten

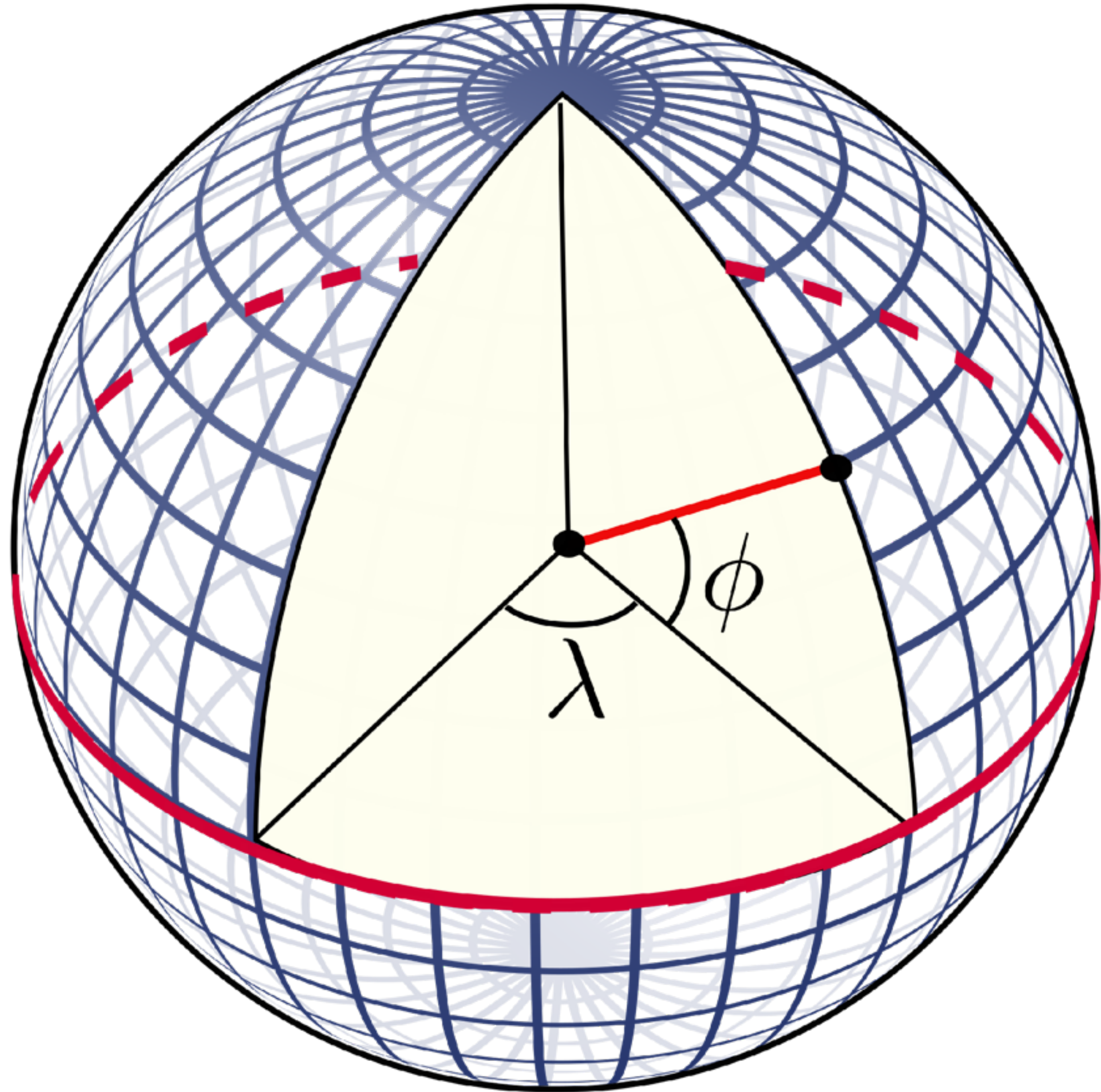


Ambitie

- ik wil dat je je nooit meer vergist
- nooit meer *latitude* en *longitude* door elkaar halen

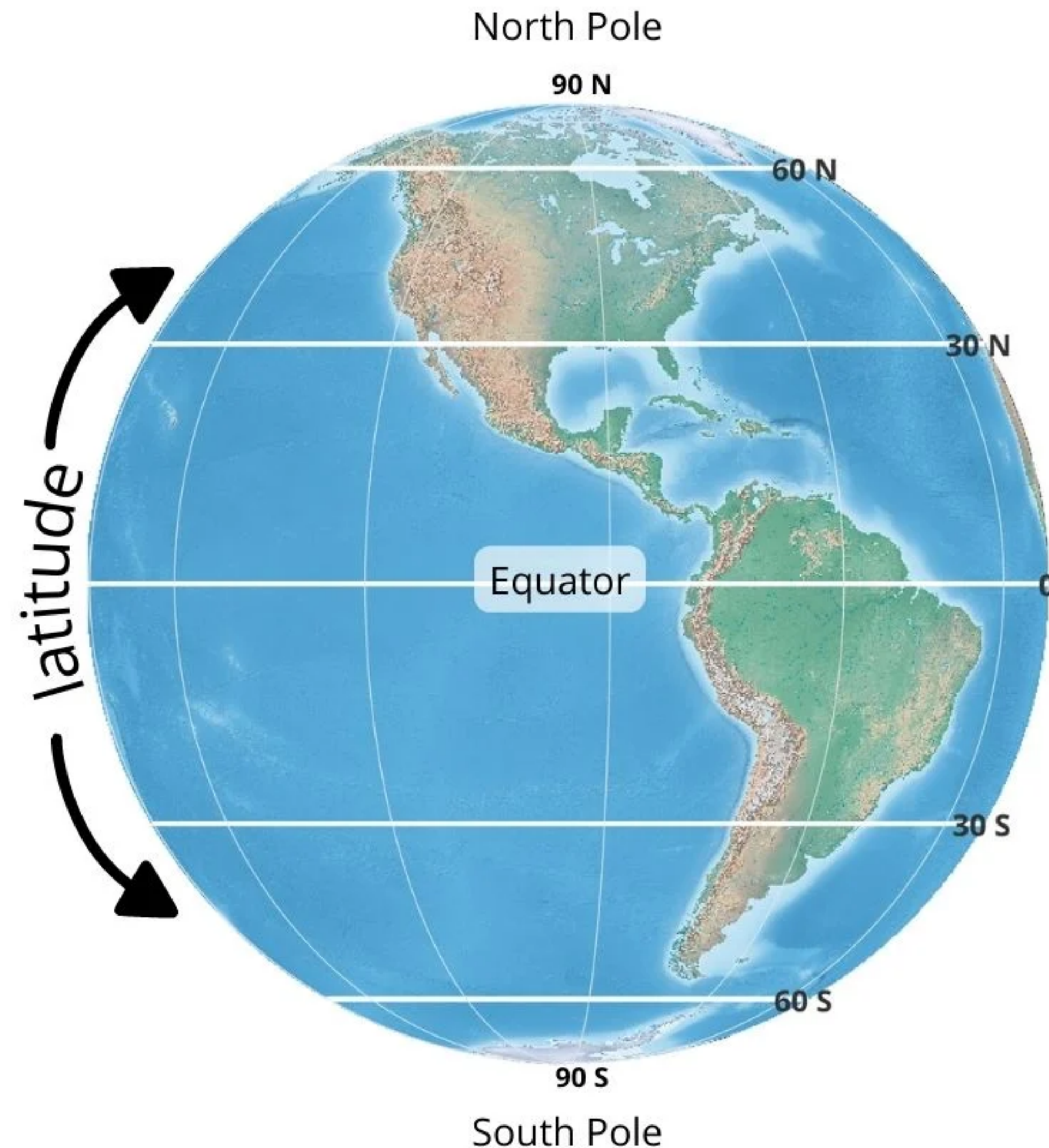
Bol-coördinaten

- breedte
 - *latitude* ϕ
- lengte
 - *longitude* λ



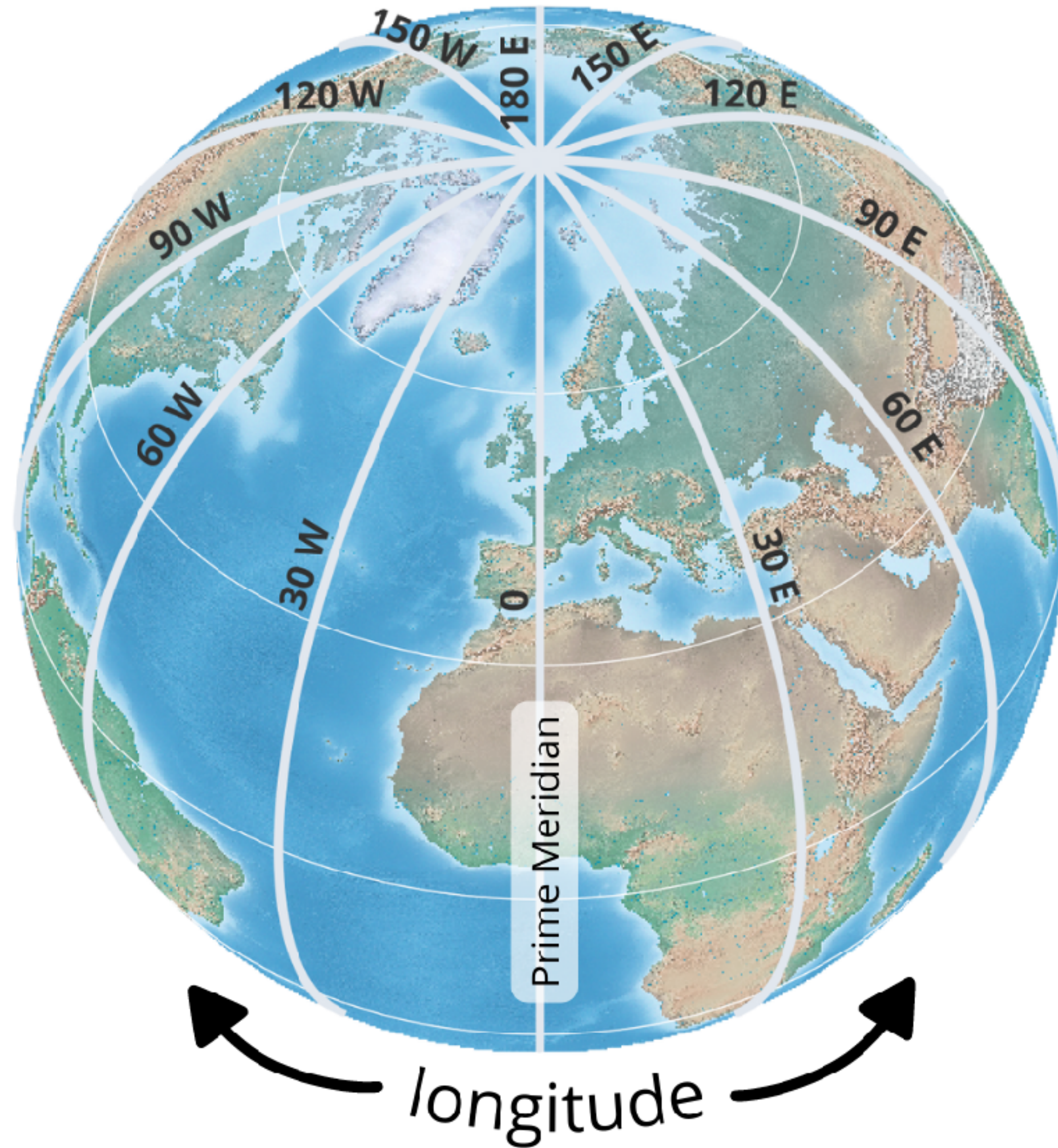
Breedtegraad

- Latitude
- Noorderbreedte
 - $0 \rightarrow 90$ graden
- Zuiderbreedte
 - $0 \rightarrow -90$ graden



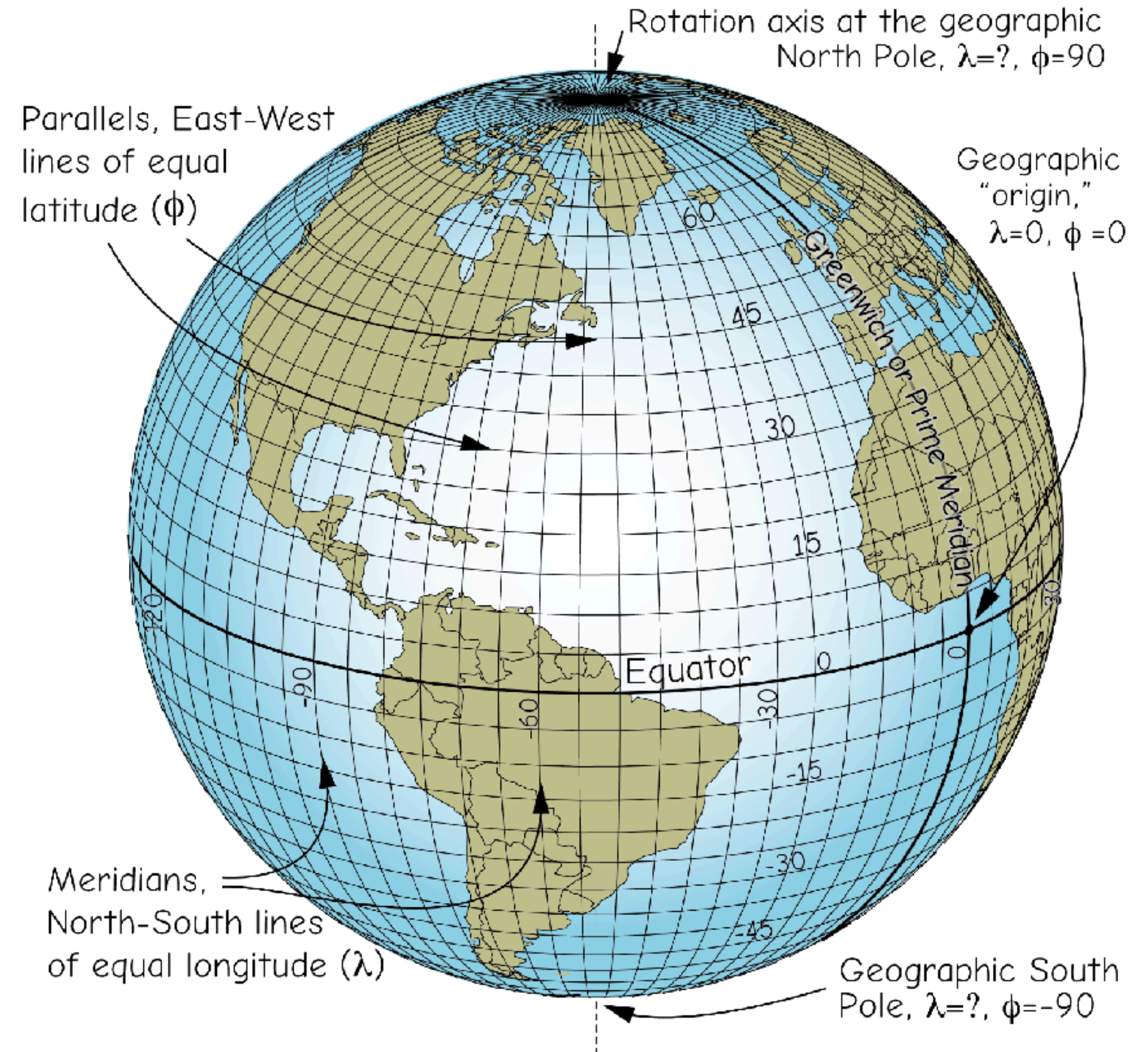
Lengtegraad

- Longitude [*veel laaaaaanger*]
- Oosterlengte
 - $0 \rightarrow 180$ graden
- Westerlengte
 - $0 \rightarrow -180$ graden

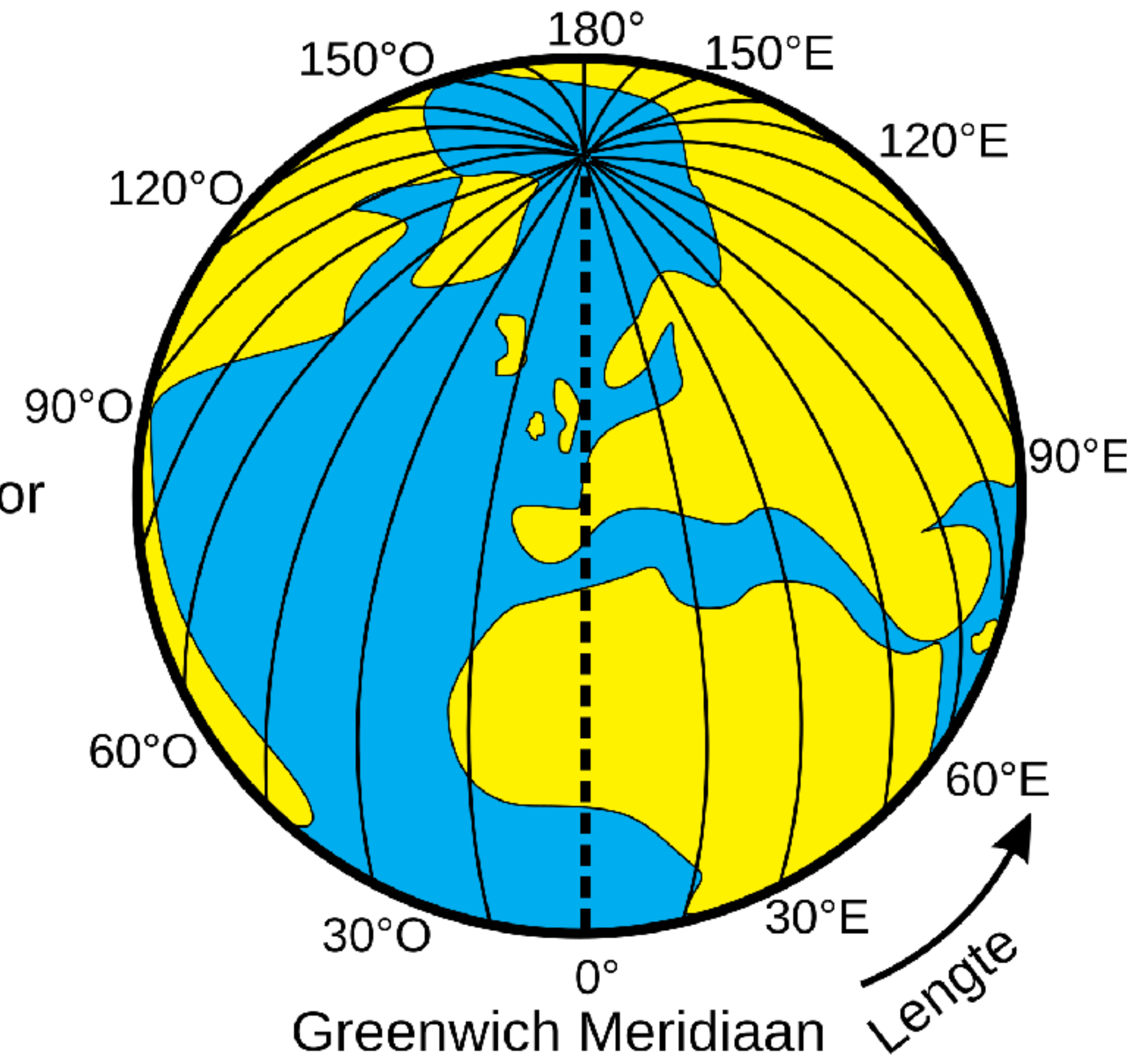
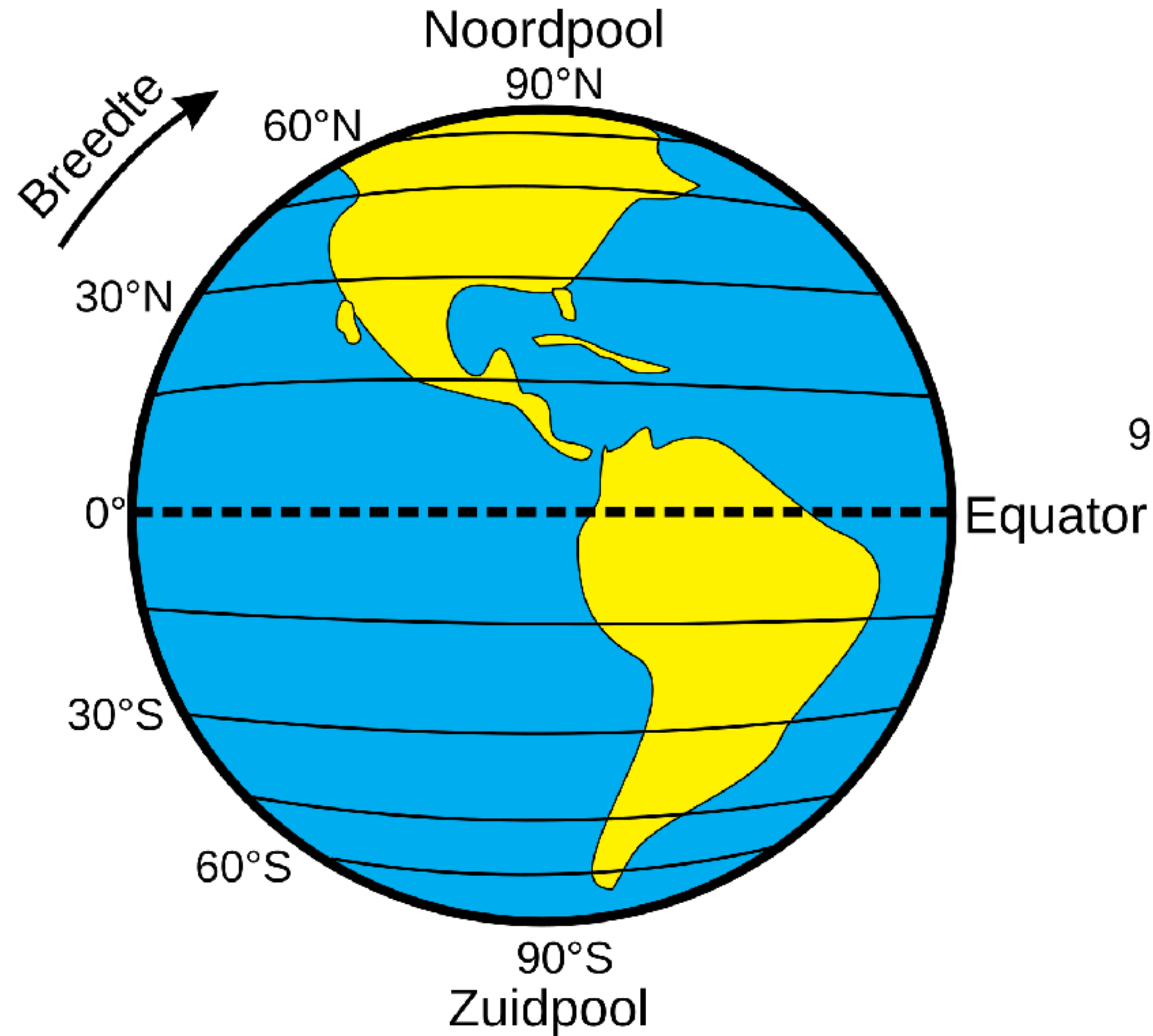


Grote en kleinere cirkels

- **meridianen**
 - vaste lengte/longitude
 - Greenwich → 0 graden
- **paralellen**
 - vaste breedte/latitude
 - evenaar → 0 graden



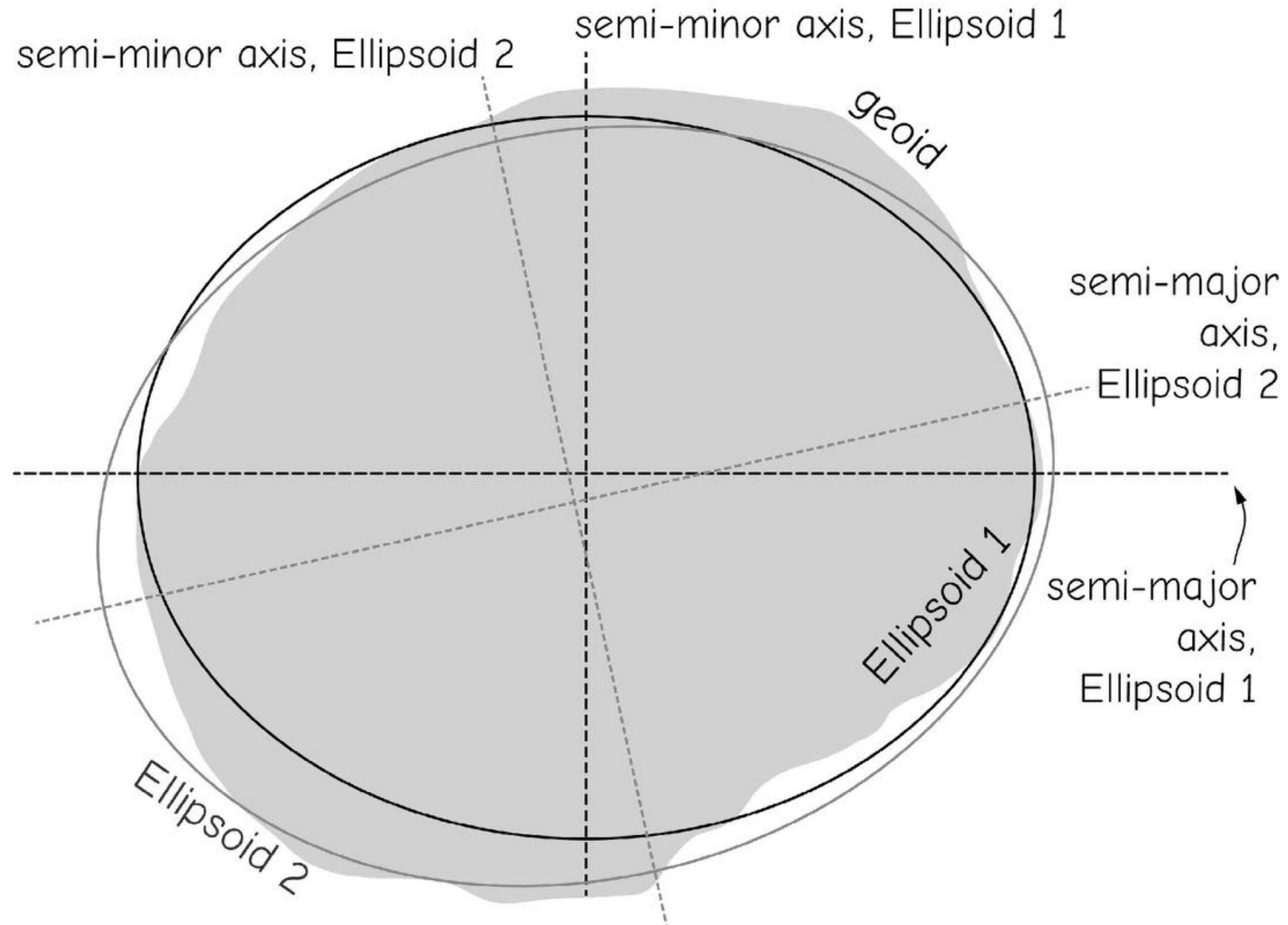
Geografische coördinaten



Waar is de oorsprong $(0,0)$?

- internationale afspraak sinds 1884
- longitude = 0, “nul-meridiaan”
 - Greenwich, Engeland
- latitude = 0, “nul-parallel”
 - evenaar

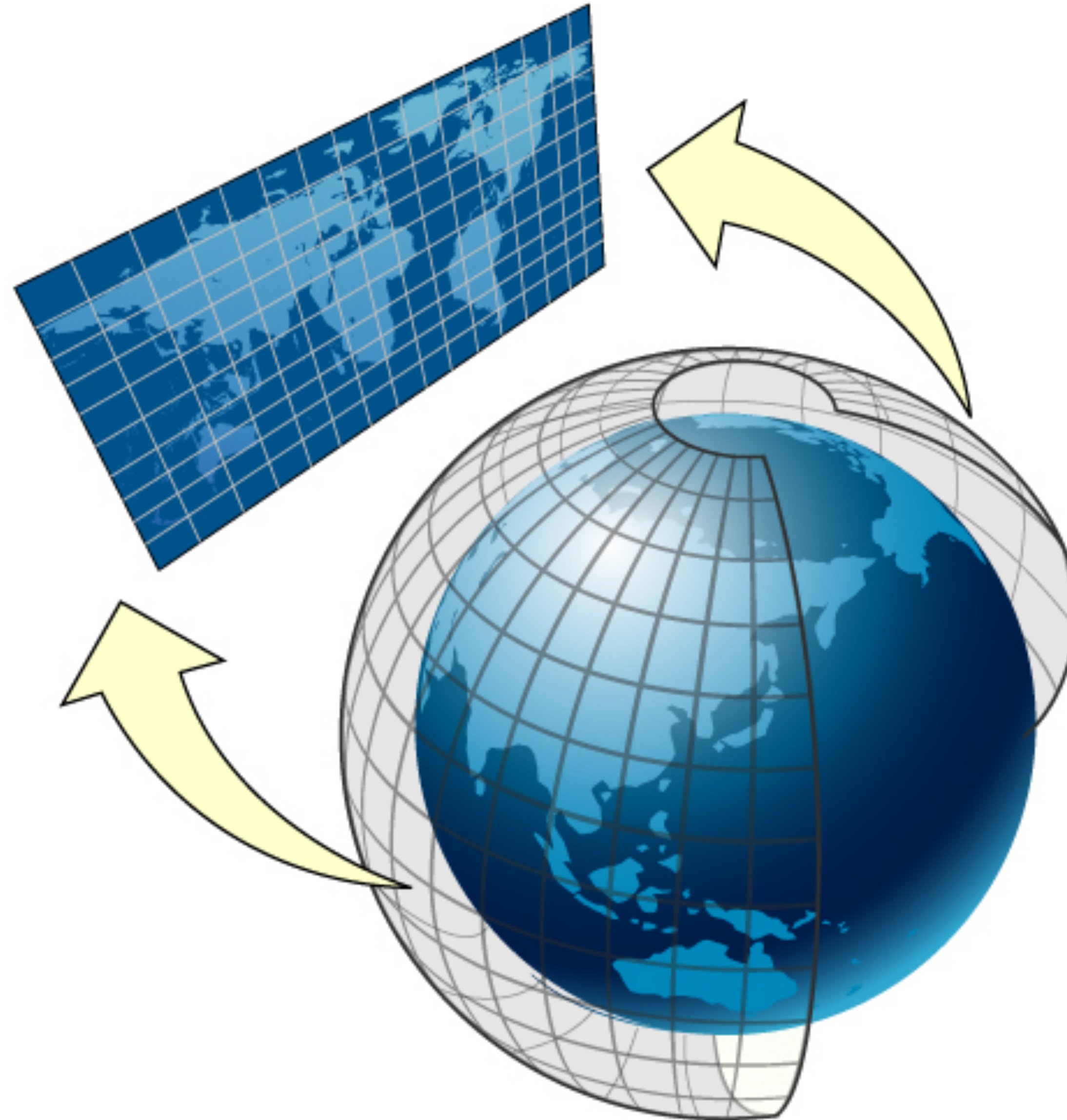
Welke sferoïde?



Waar is de oorsprong $(0,0)$?

- internationale afspraken
- belangrijkste “datums” voor ons:
 - World Geodetic System 1984 (WGS 84) → GPS !
 - Amersfoort coördinaten (RD New)

Geografische projecties

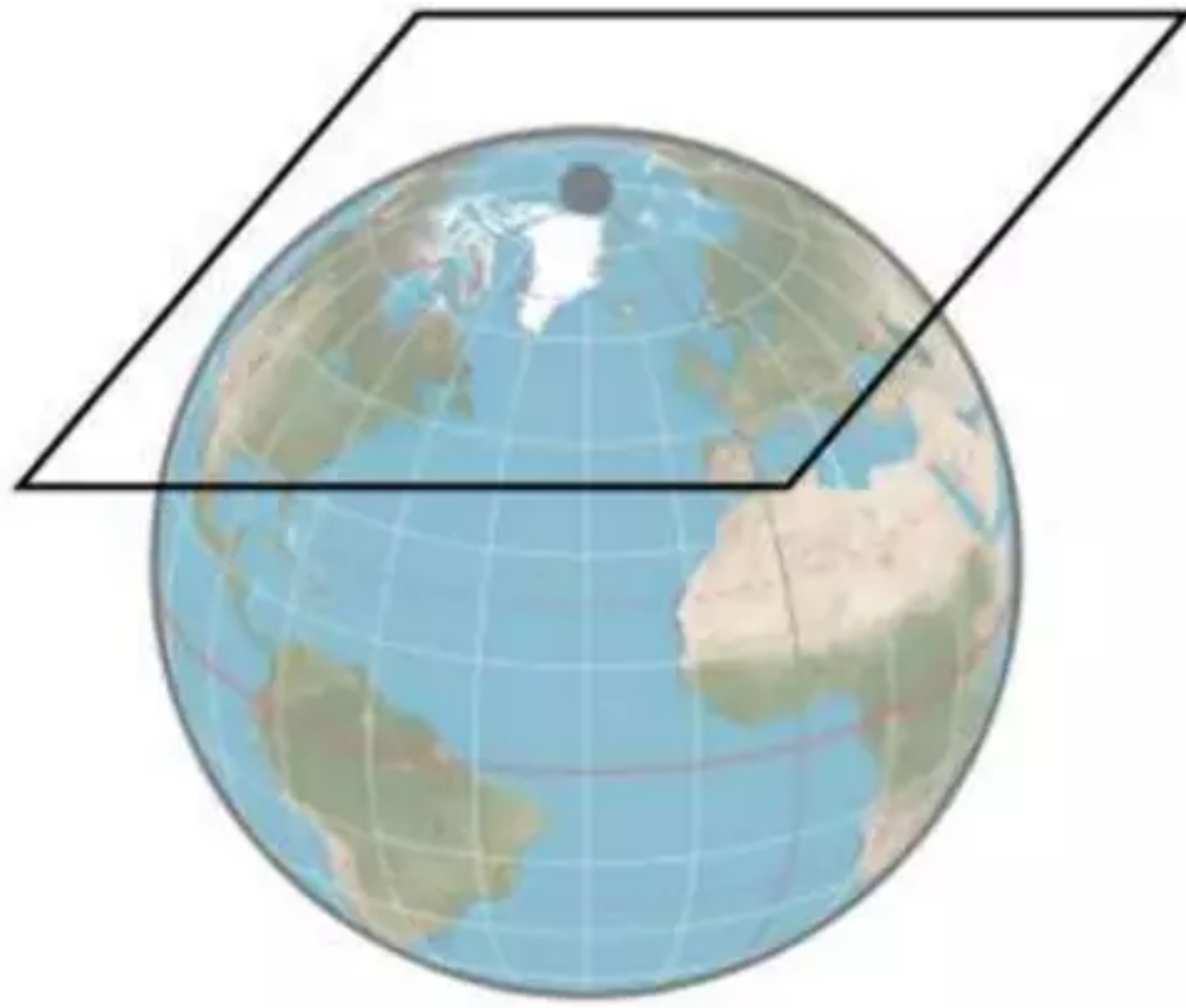




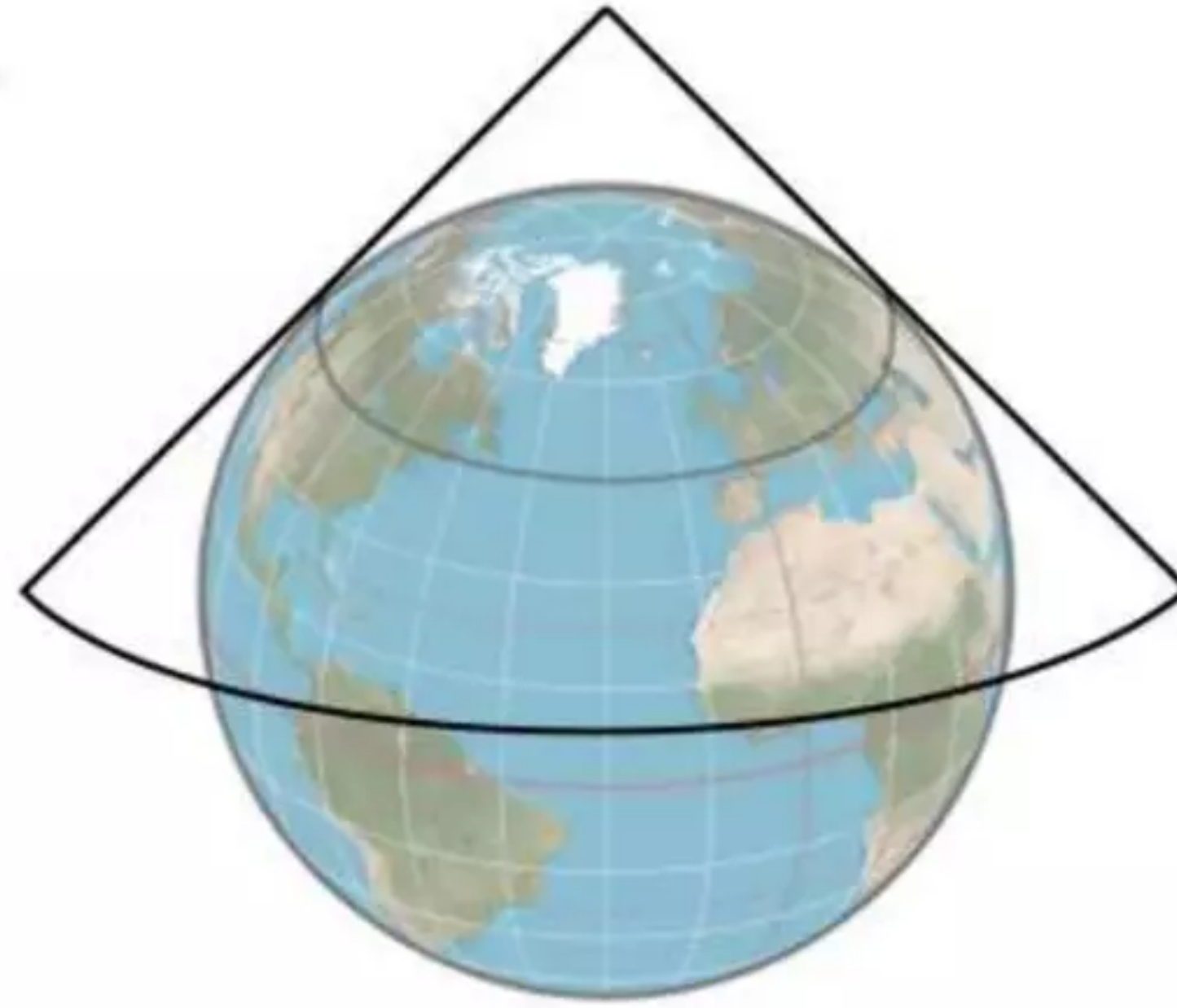
Mercator projectie



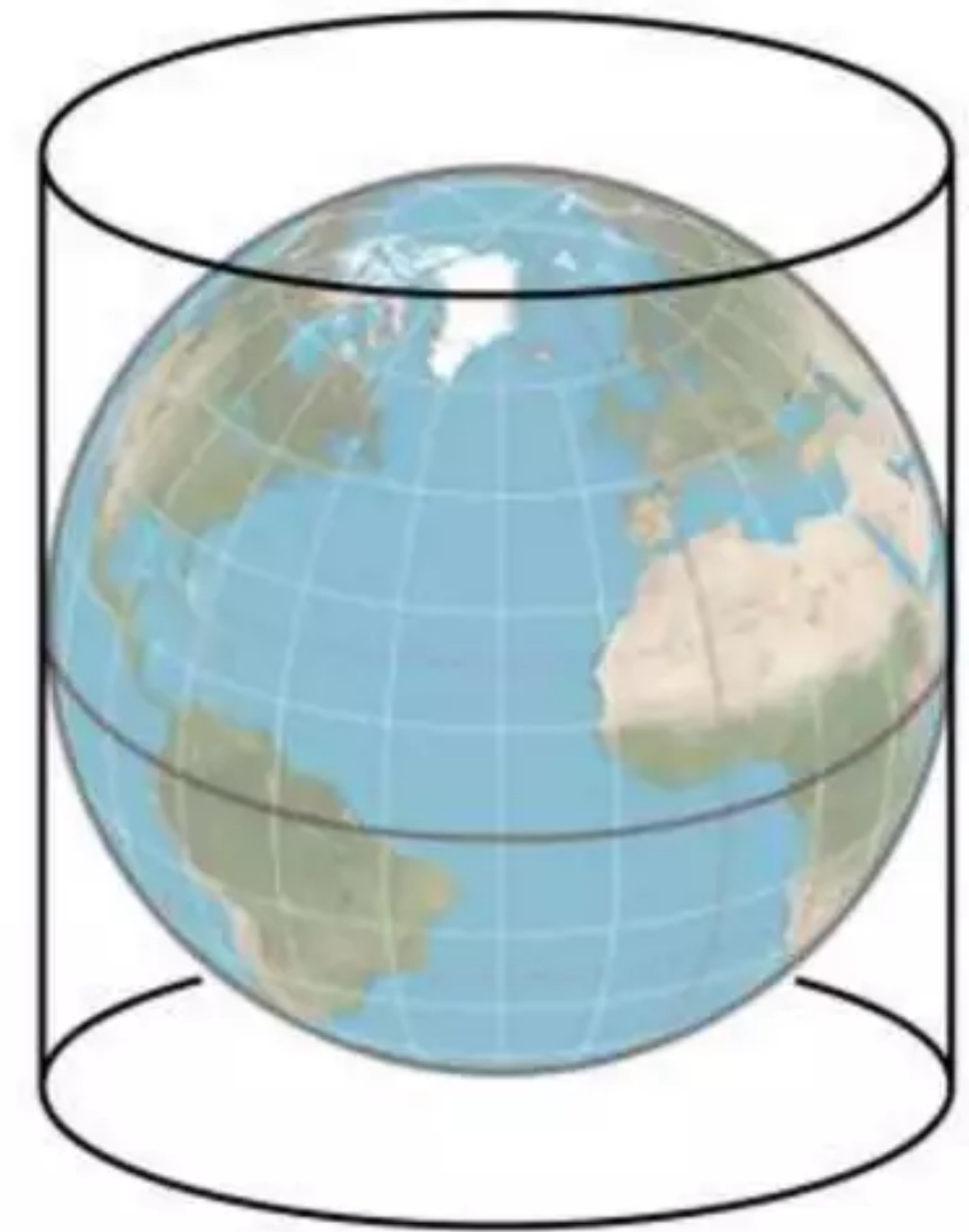
Projecties



plat

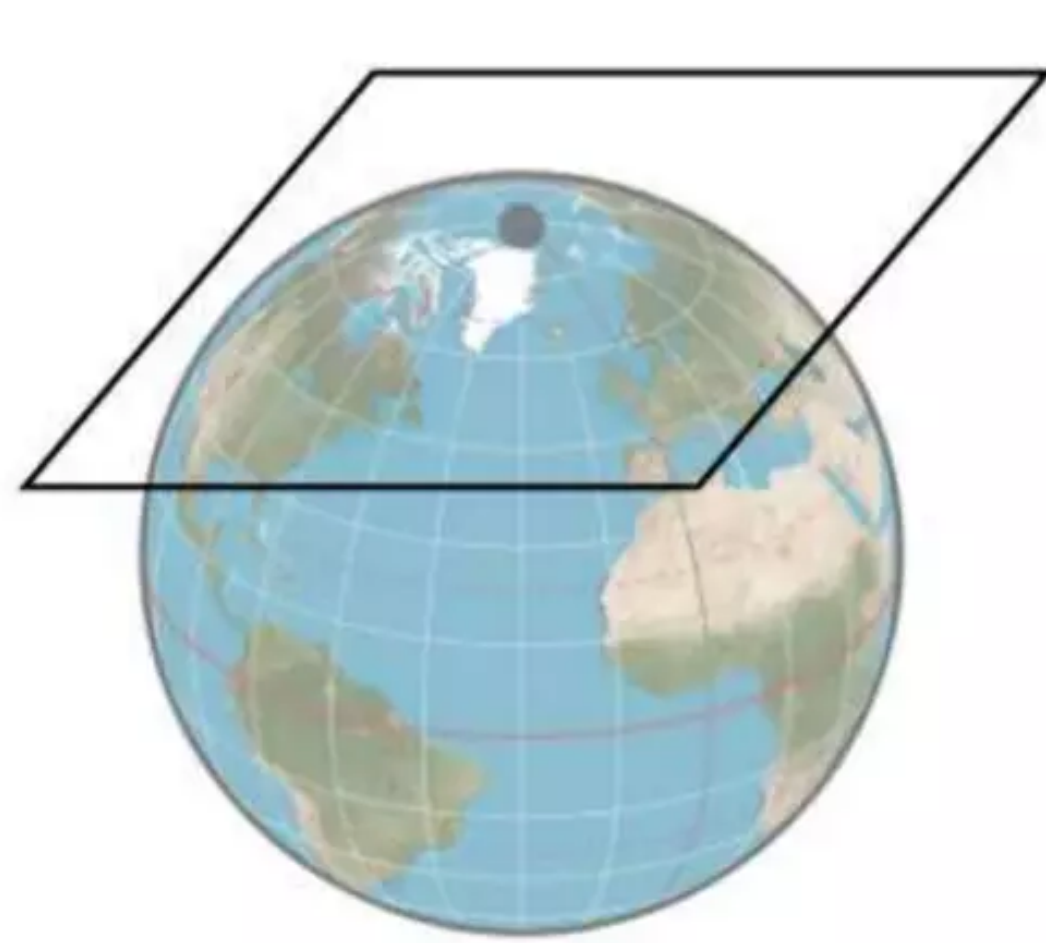


conisch

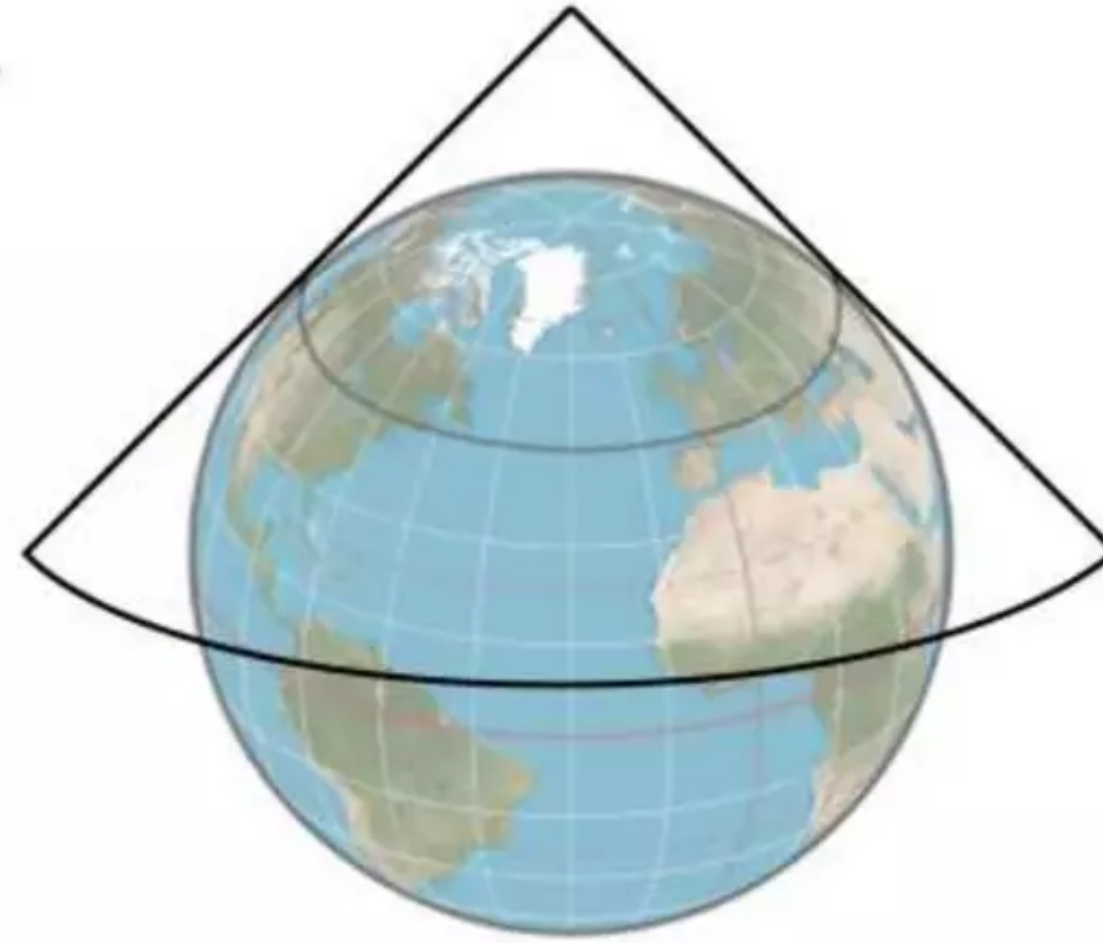


cilindrisch

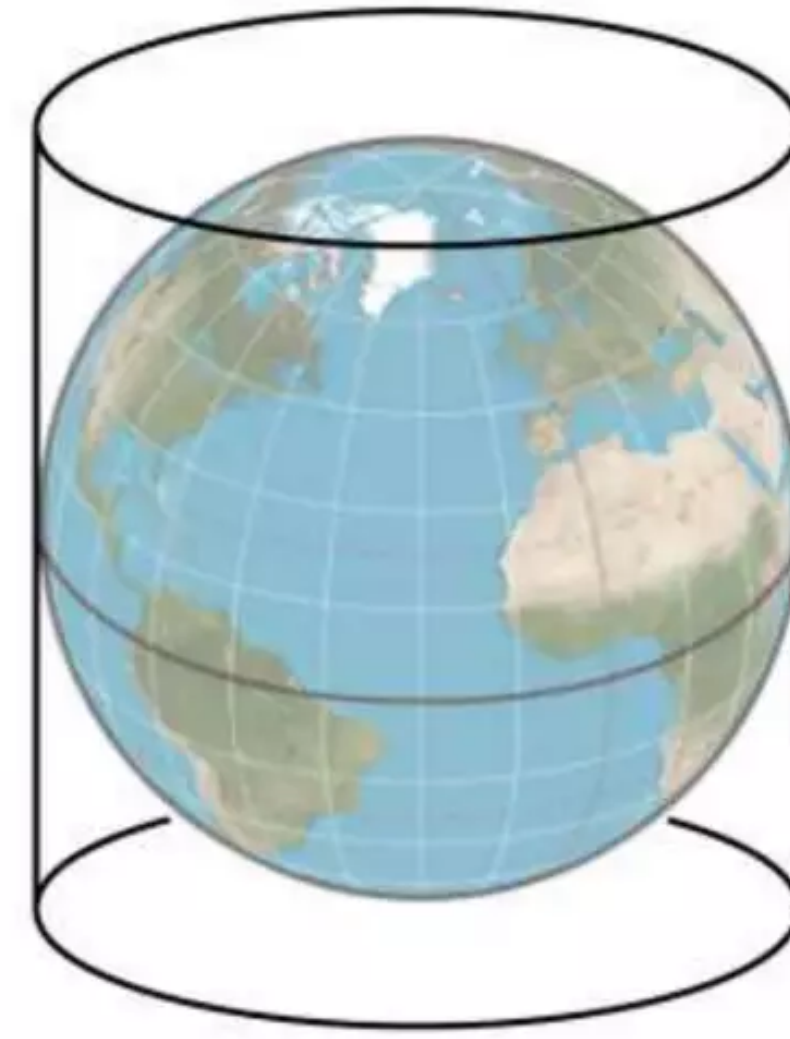
Projecties



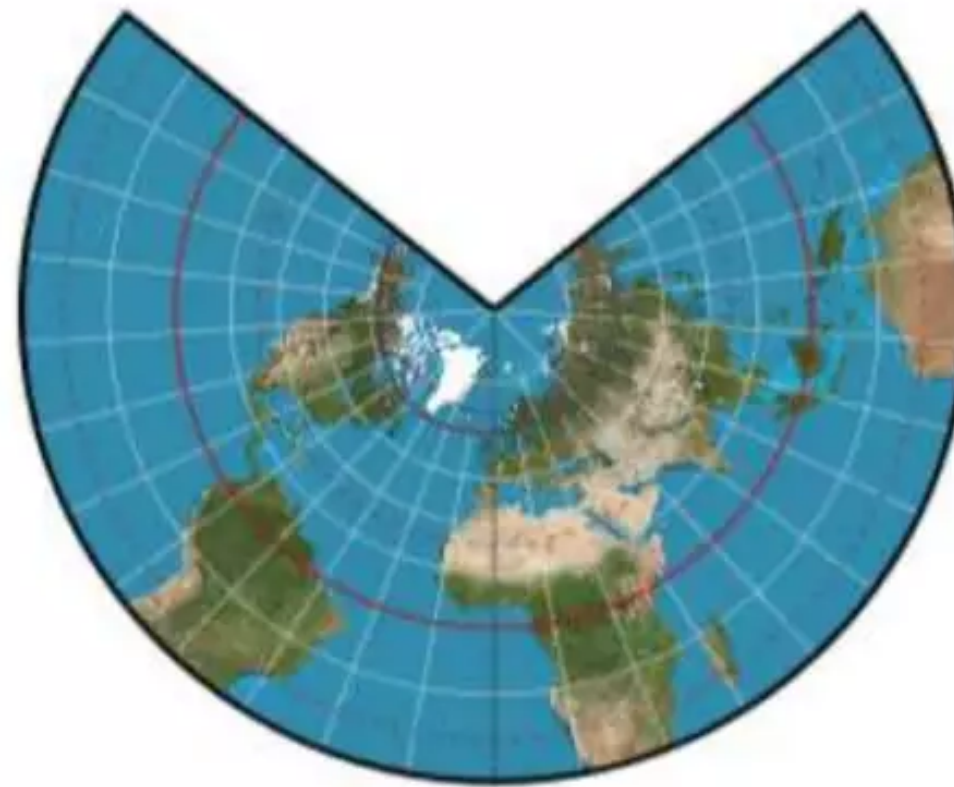
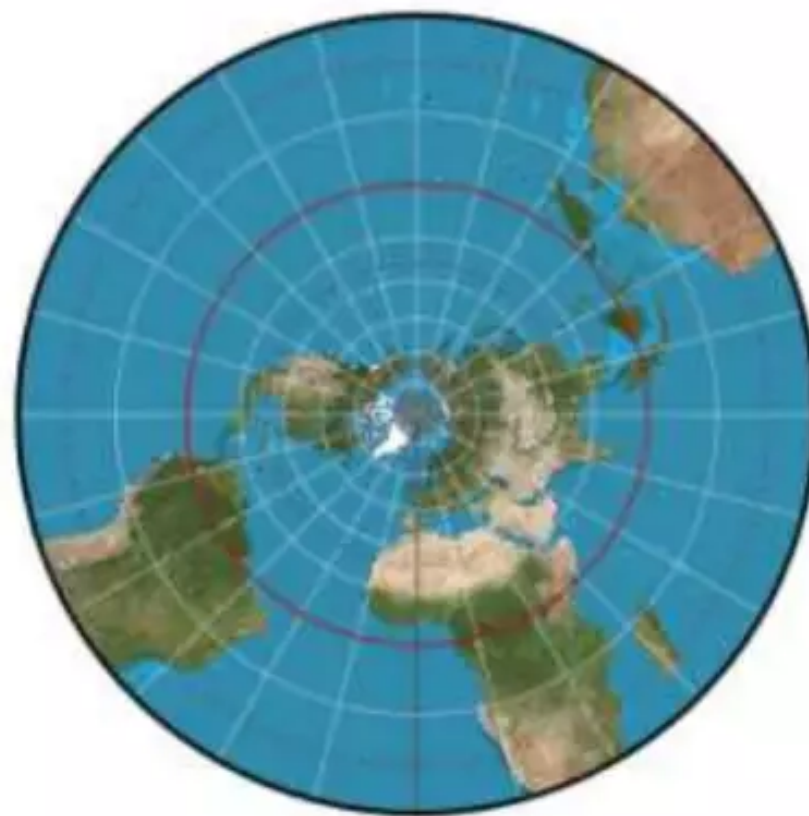
plat

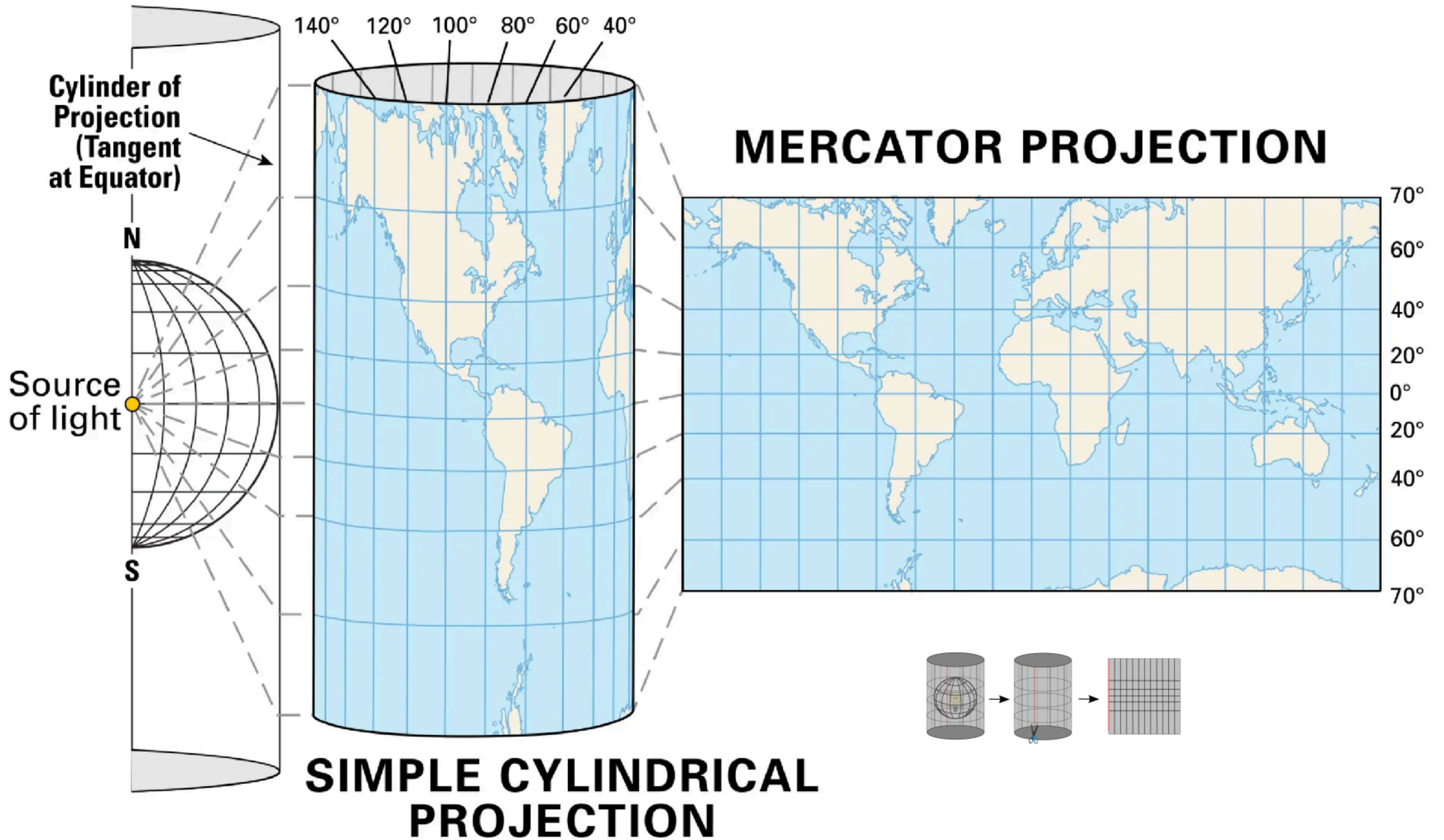


conisch

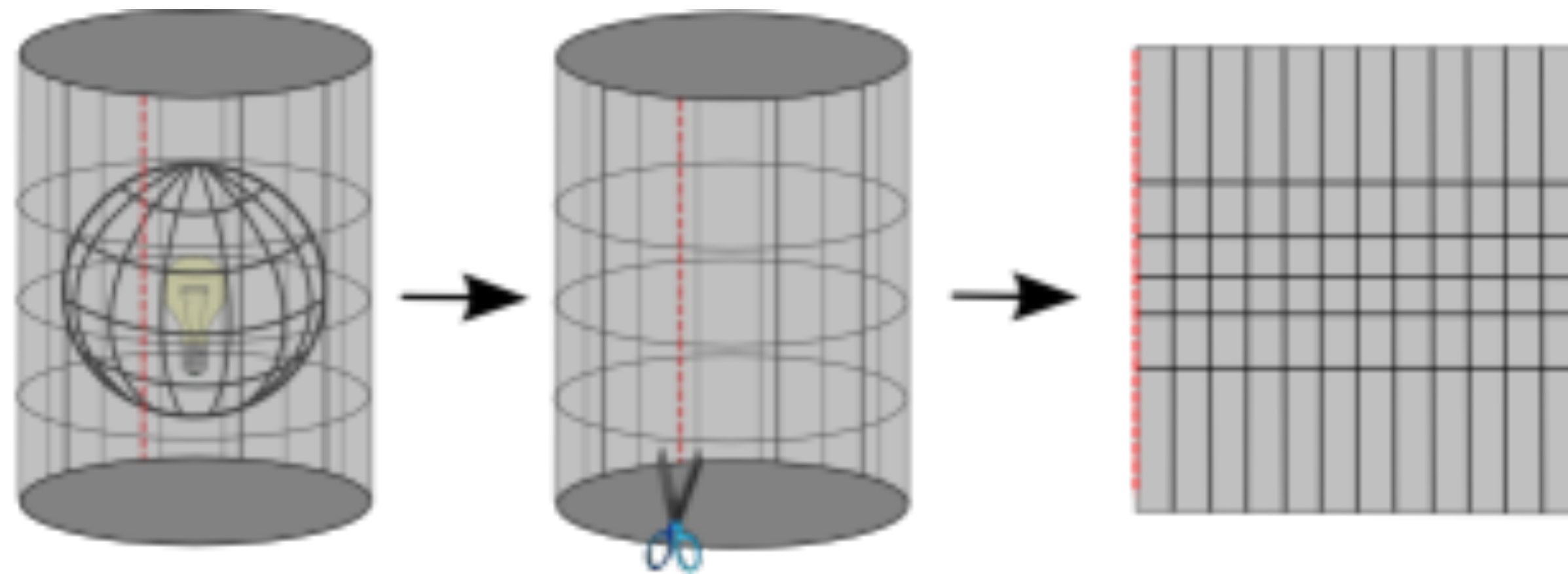


cilindrisch





Mercator → cilindrische projectie



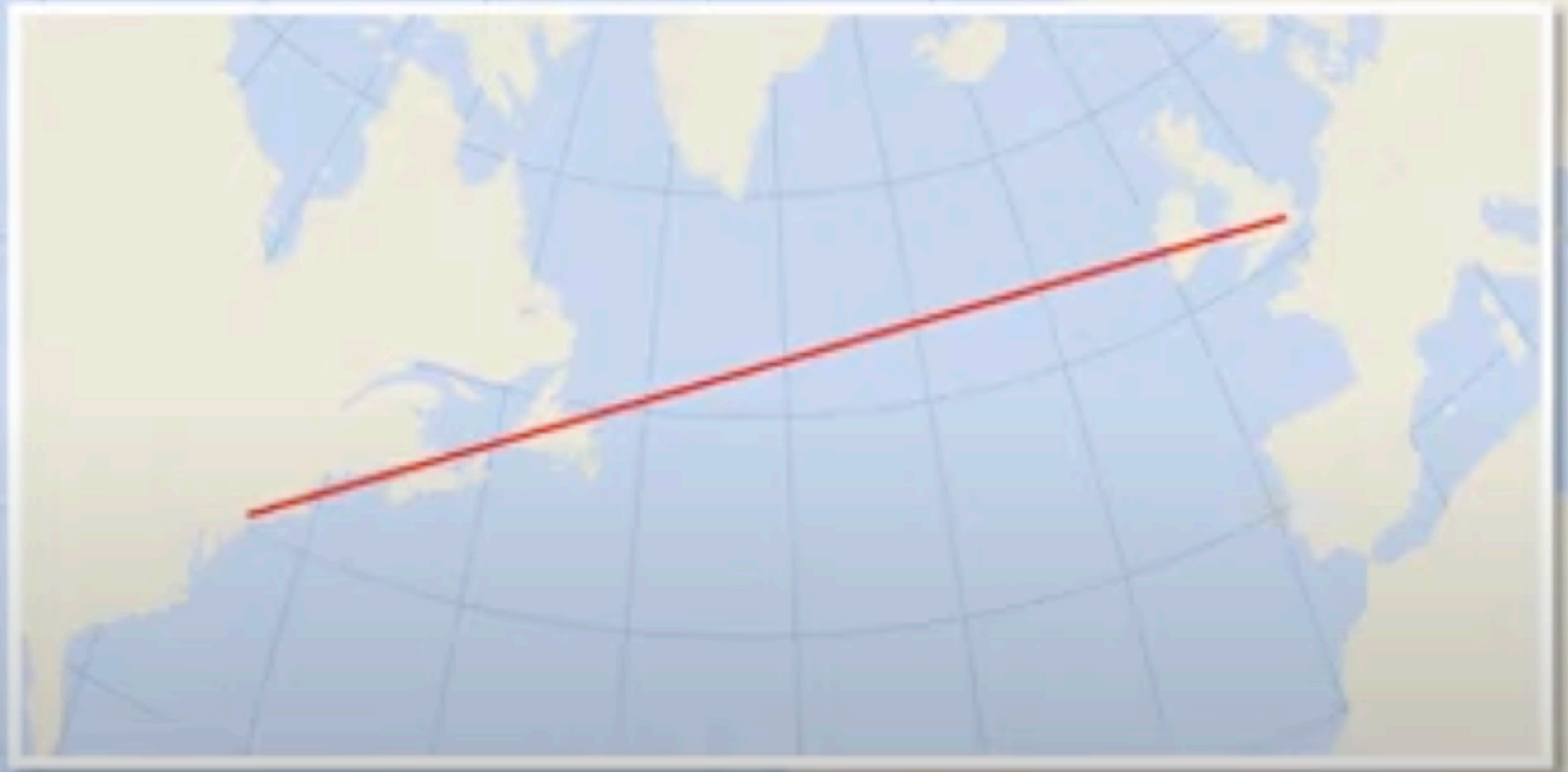


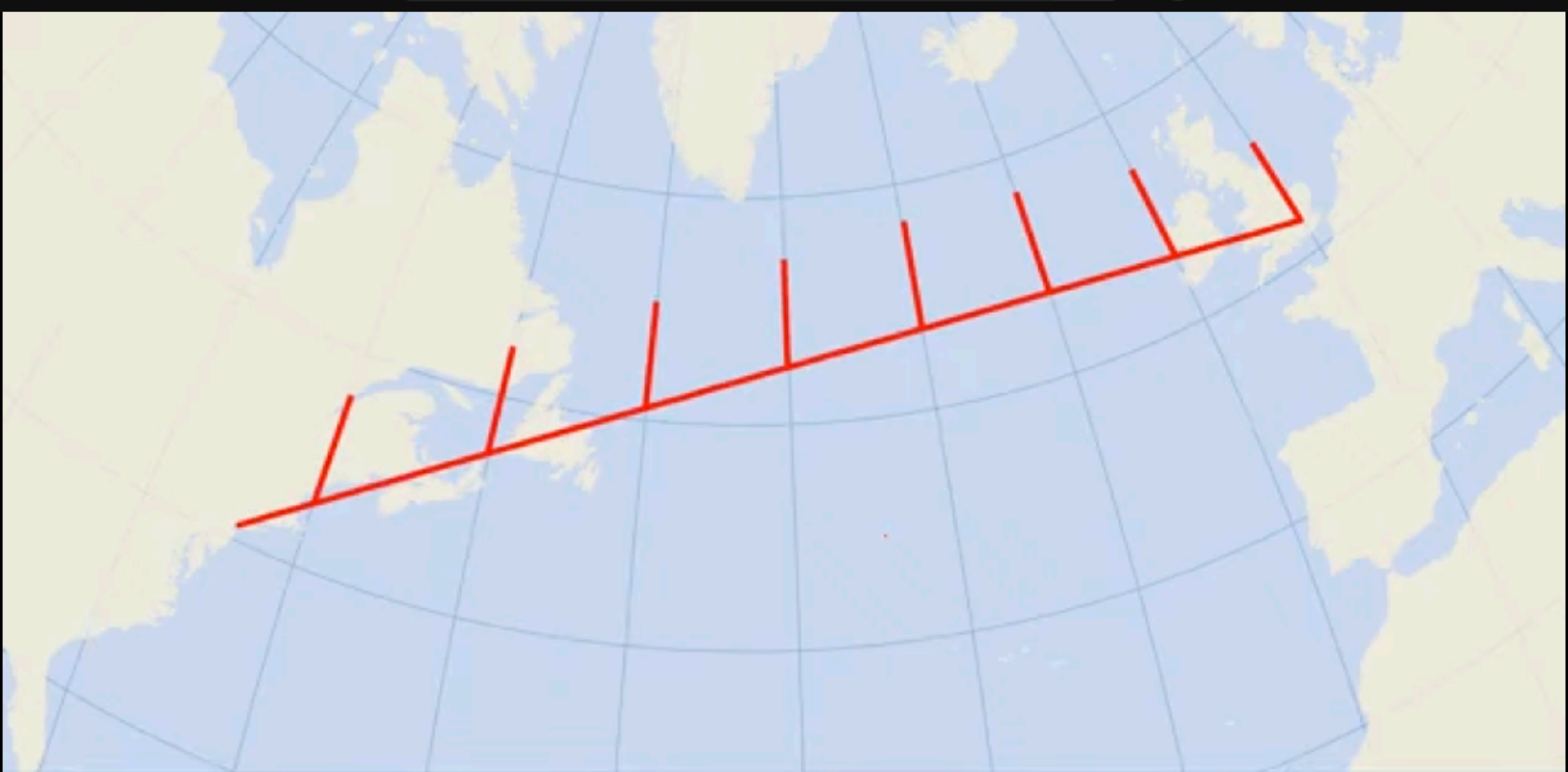
grote cirkel

Great circle

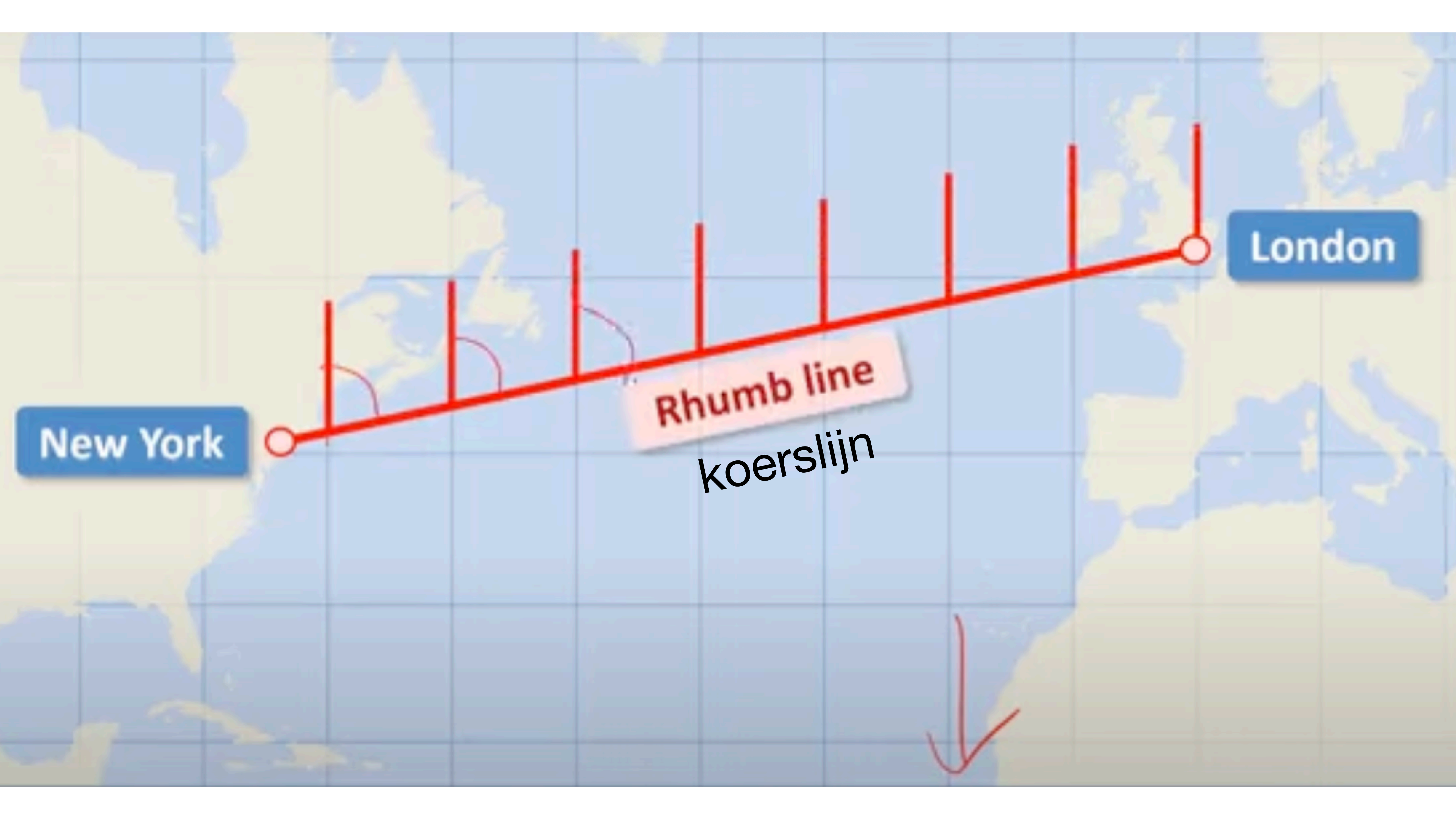
New York

London





Angles are all different



New York

London

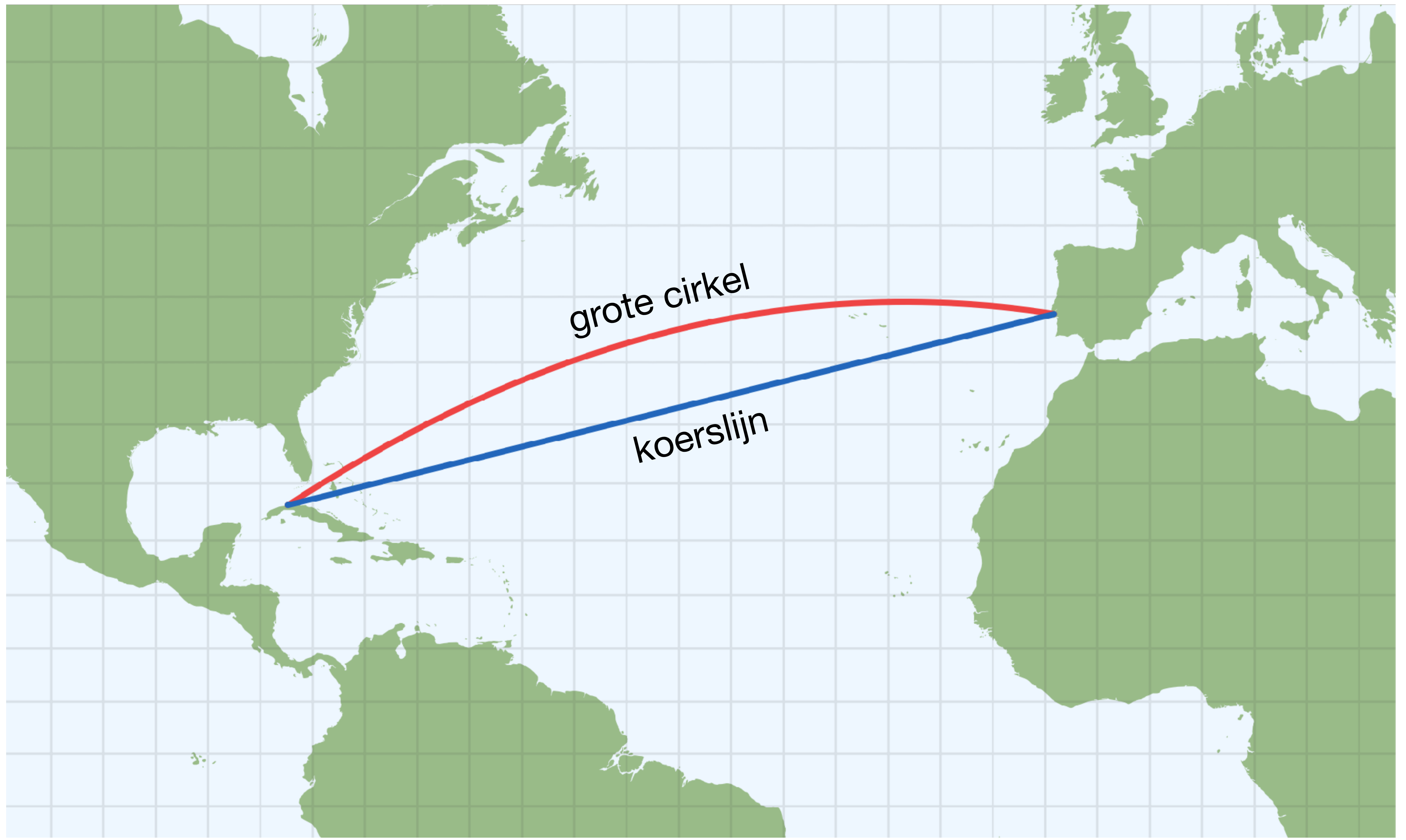
Rhumb line

koerslijn



grote cirkel

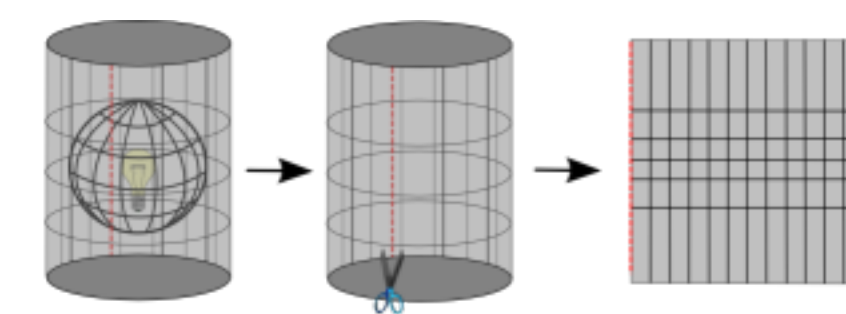
koerslijn



Mercator
projectie
is ontworpen
voor
**navigatie
op zee**



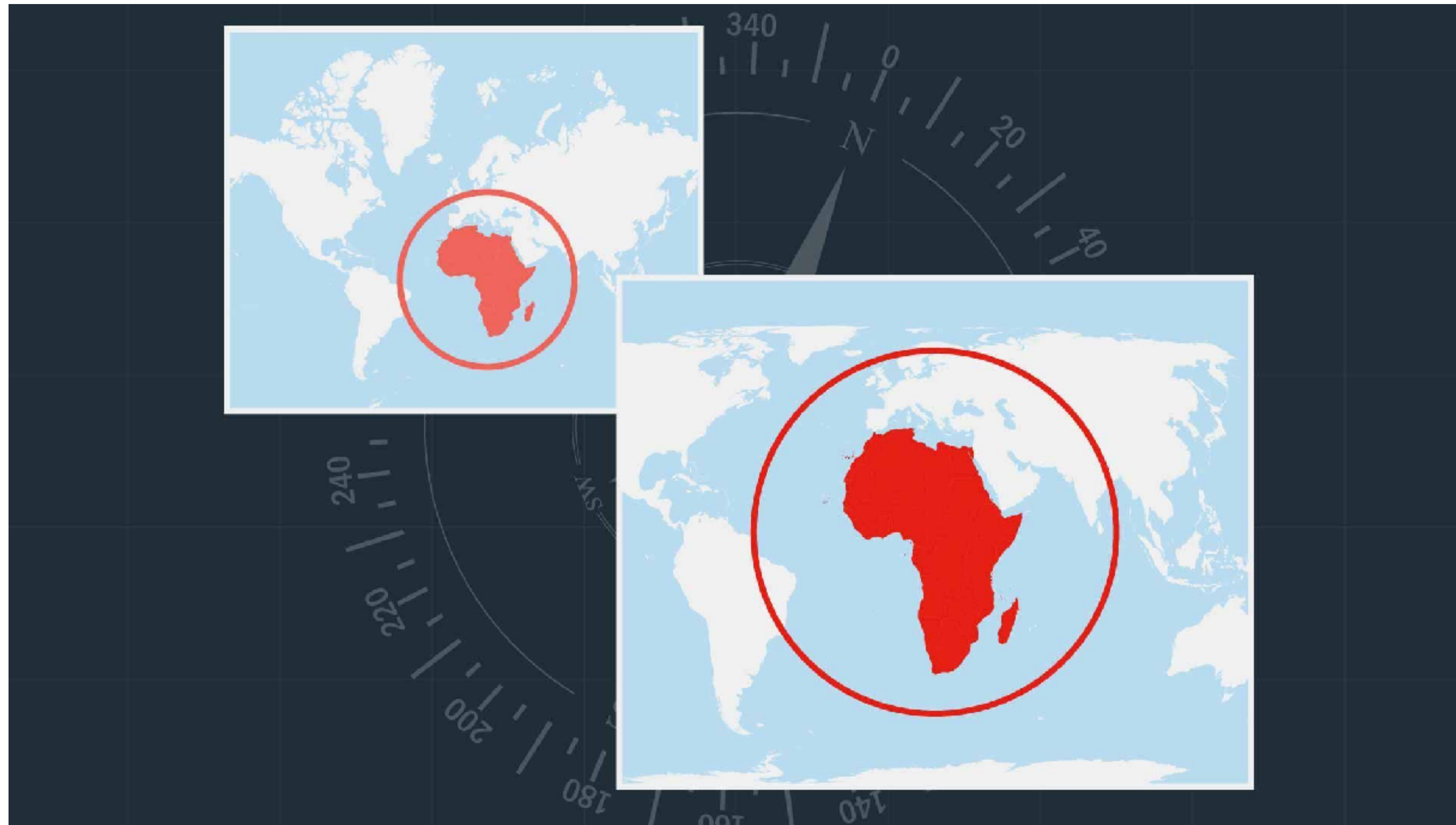
extreme
breedte
is
uitgerekt



rechthoekig
rooster

extreme
breedte
is
uitgerekt

Mercator in het nieuws



<https://nos.nl/artikel/2579147-afrika-wil-in-juiste-formaat-op-de-wereldkaart>

Mercator in het nieuws

- United Nations
 - [UN tells the world: Stop making Africa look small](#)

- van
“Mercator”
naar
“Equal Earth”



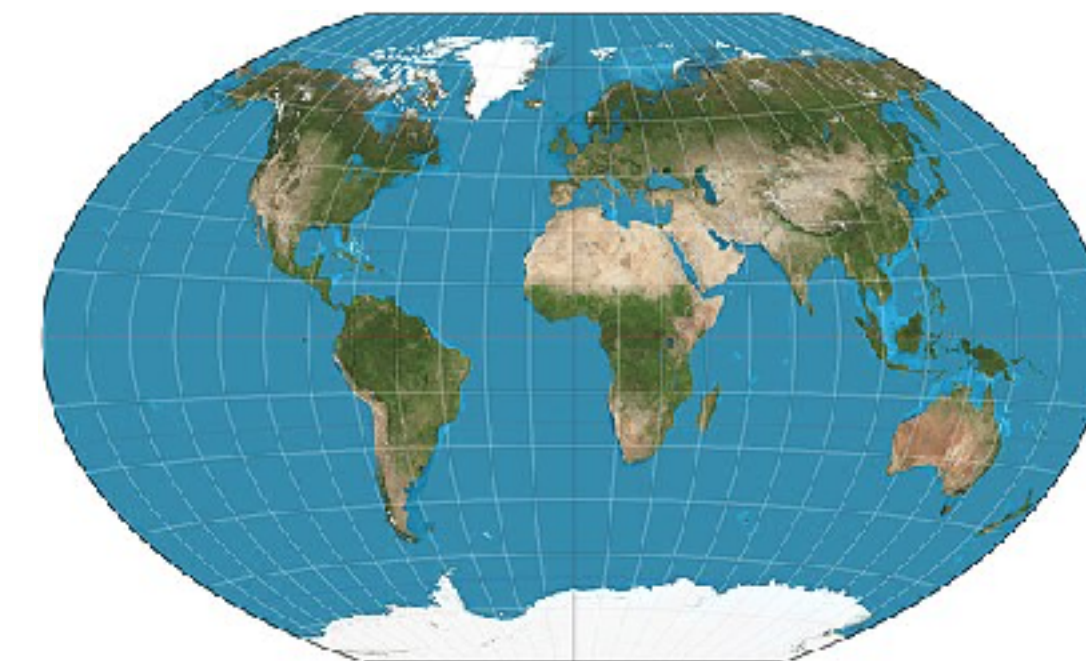
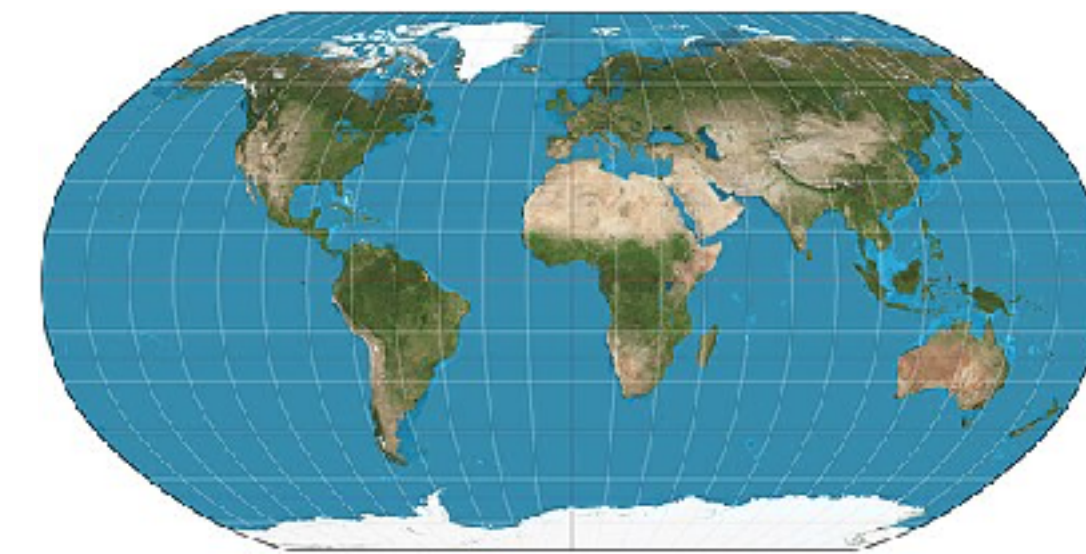
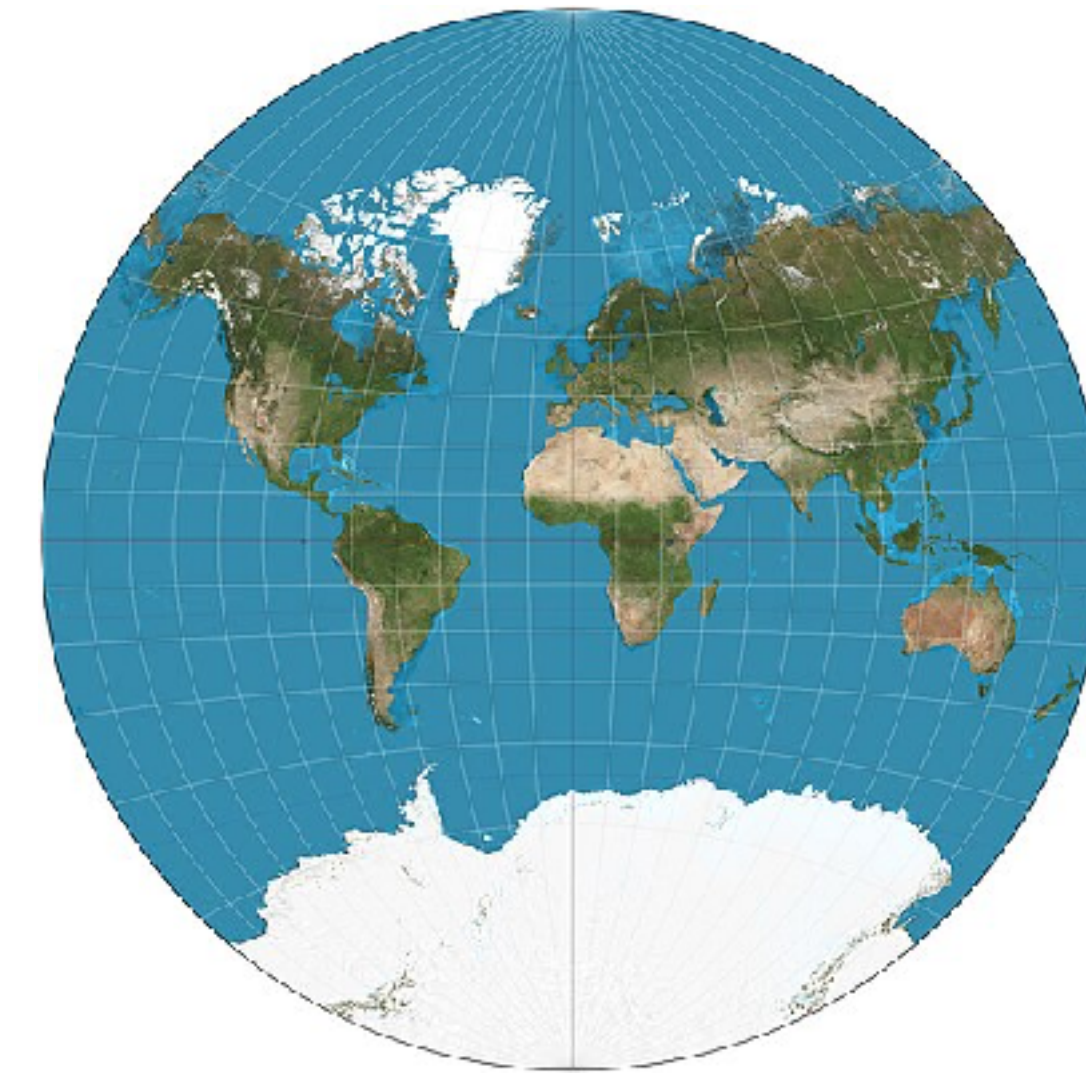
Mercator in het nieuws

- van
“Mercator”
naar
“Equal Earth”

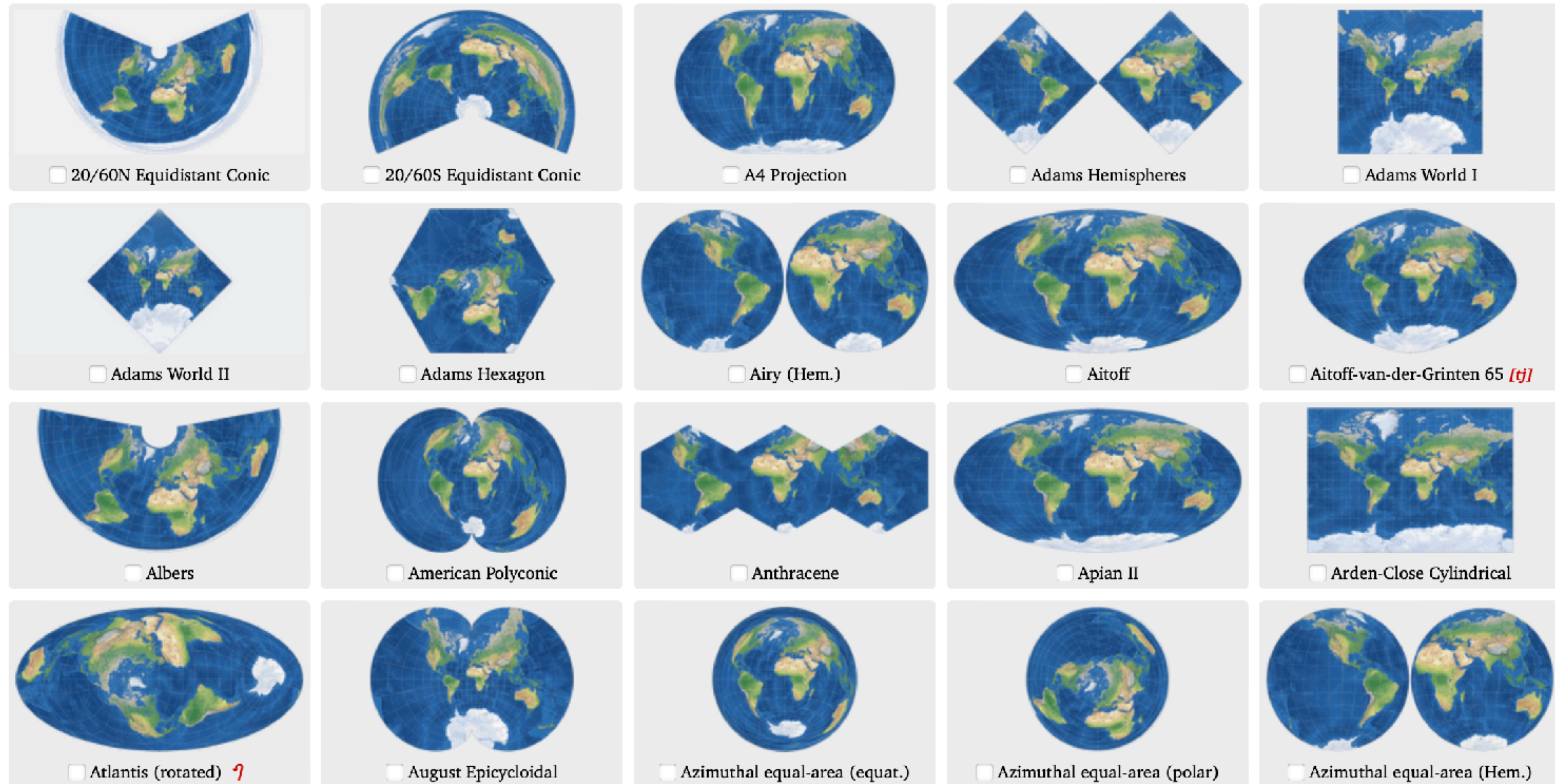


National Geographic

- **1922–1988** Van der Grinten projectie
- **1988–1998** Robinson projectie
- **1998–Present** Winkel Tripel projectie

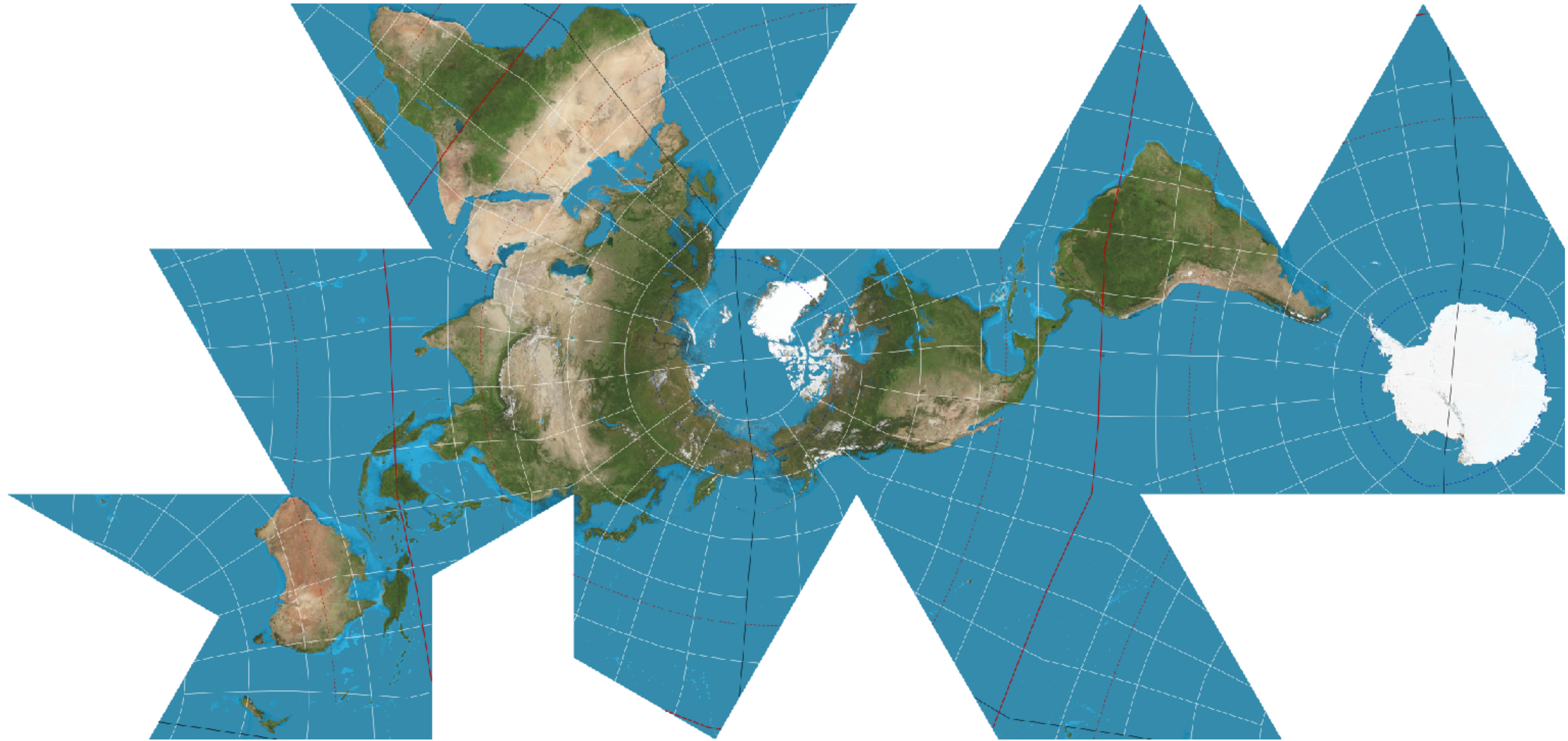


Geografische projecties

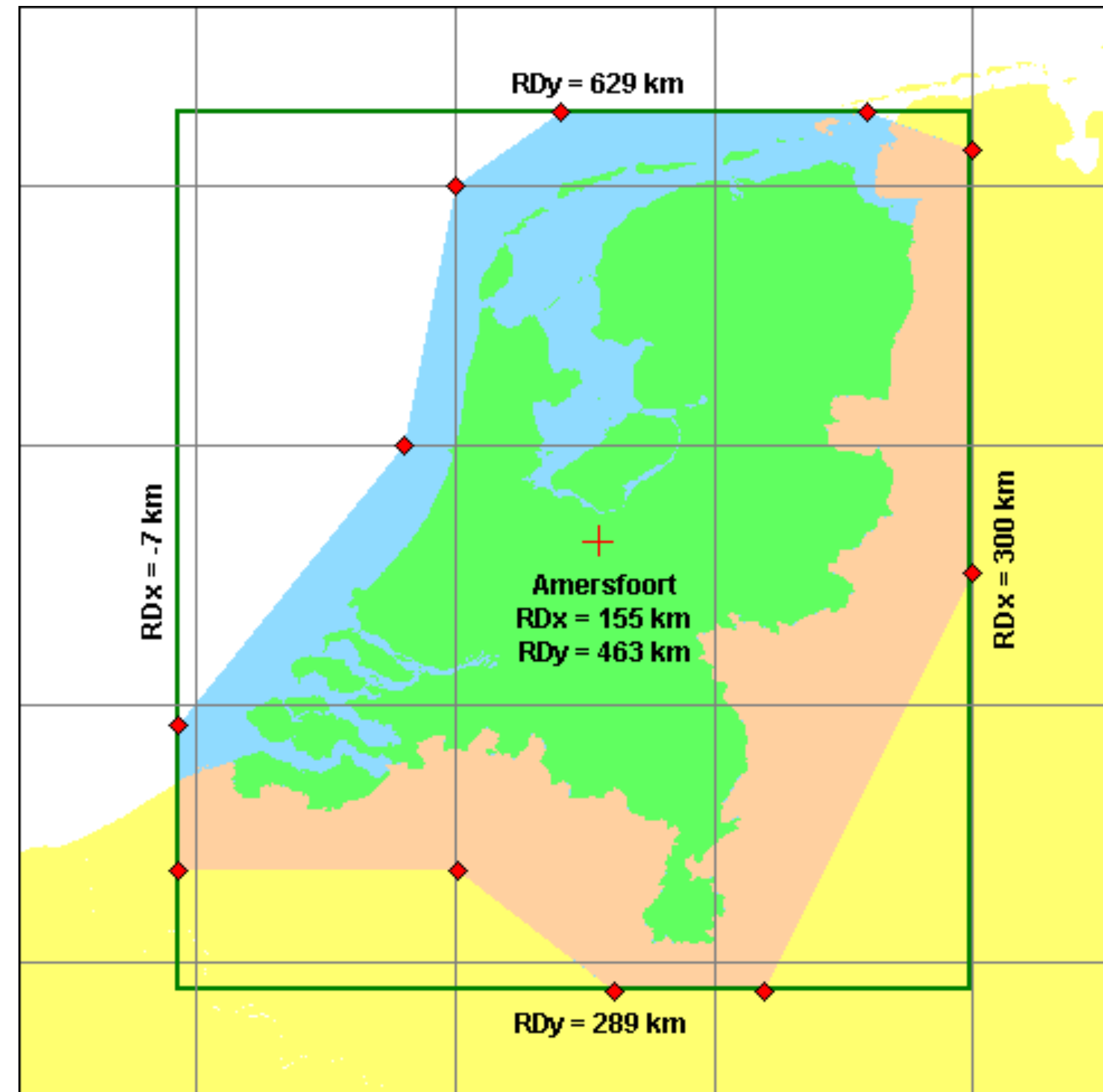


<https://map-projections.net/imglist.php>

Buckminster Fuller projectie



Rijksdriehoekskoördinaten





Nederland



Nederland

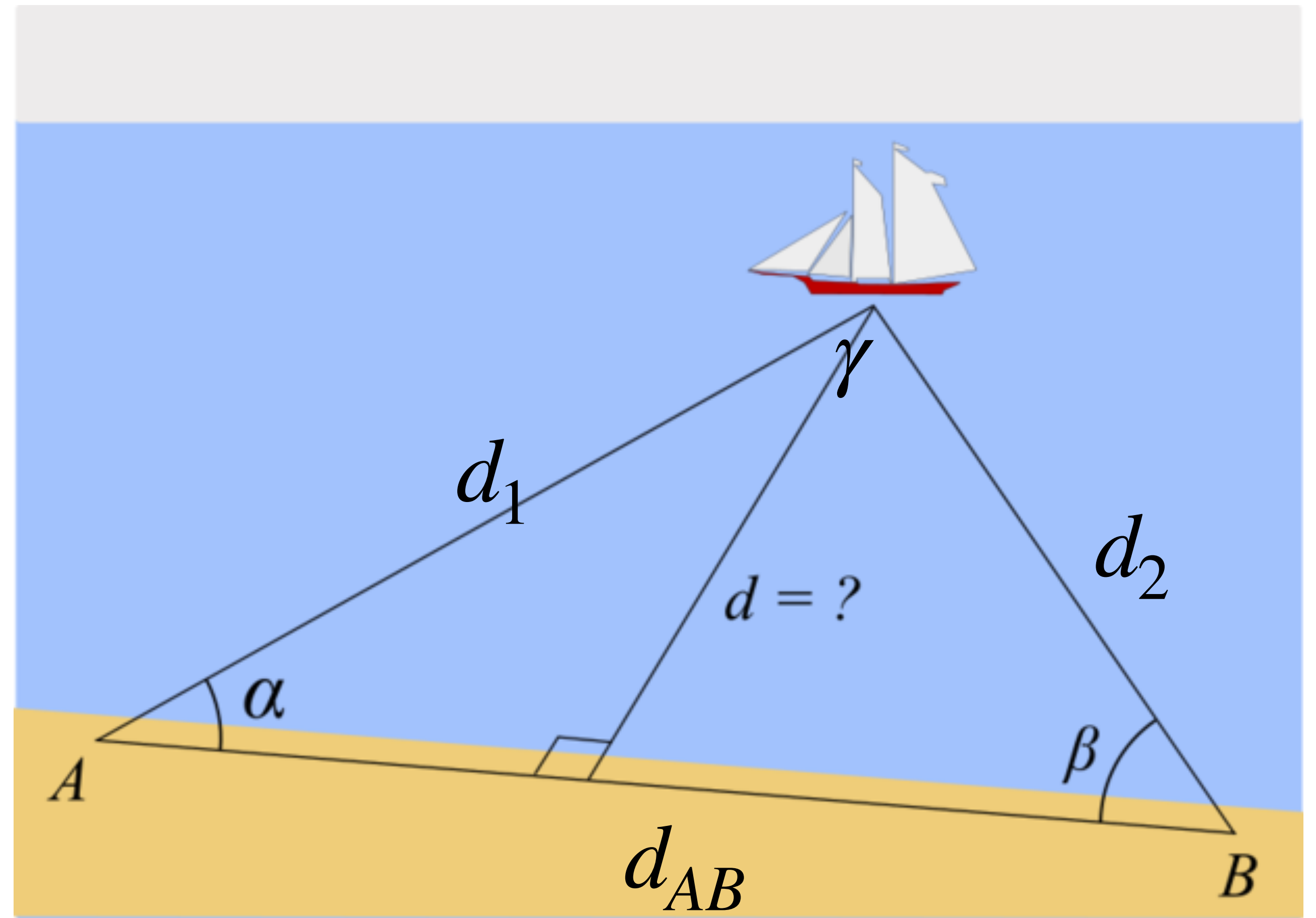


Nederland



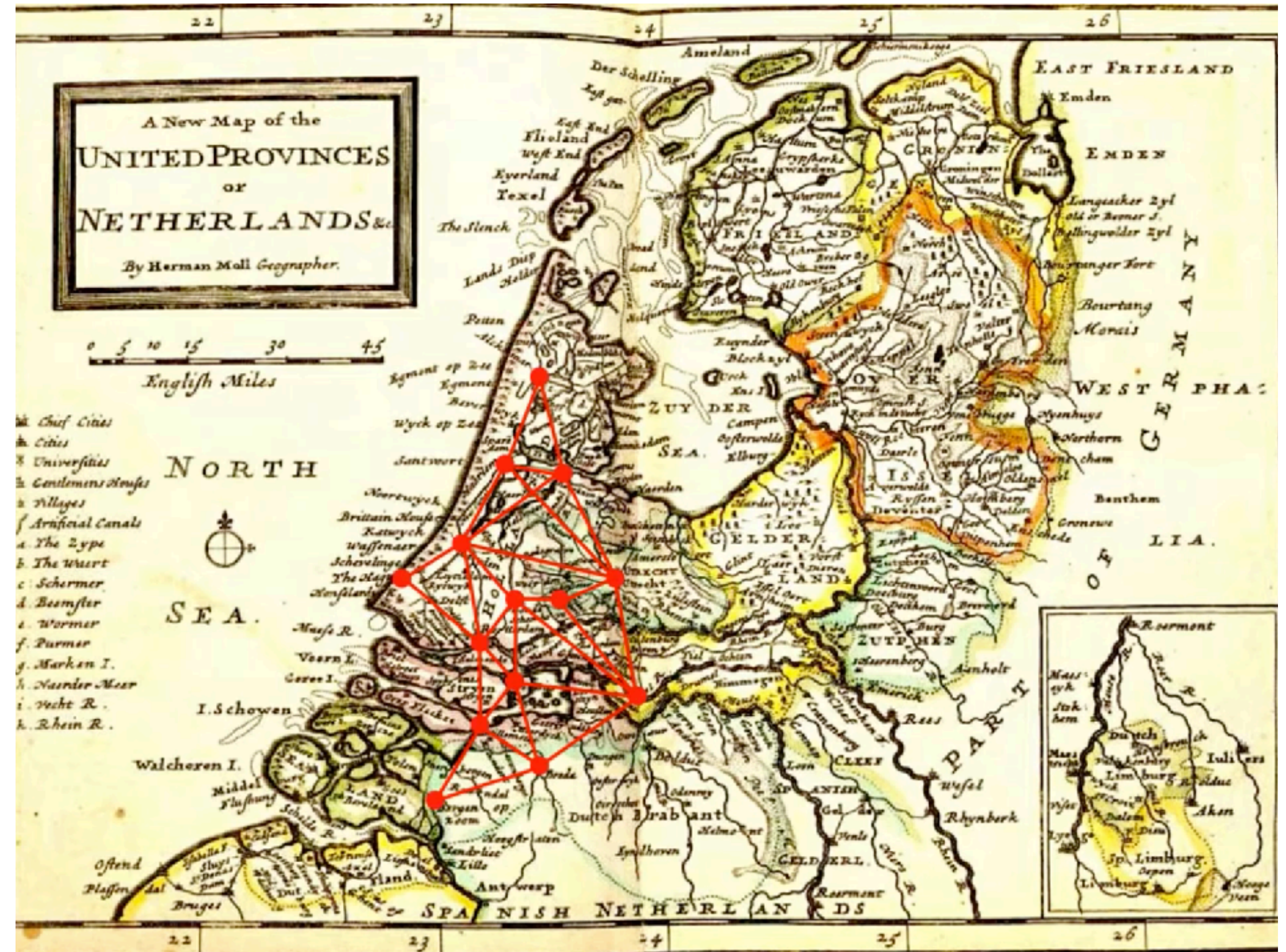
Triangulatie

- meet afstand tussen A en B
- meet hoeken α en β
- $\rightarrow$ driehoek is uit te rekenen
 - afstanden d_{AB} , d_1 , d_2 ,
 - hoek γ

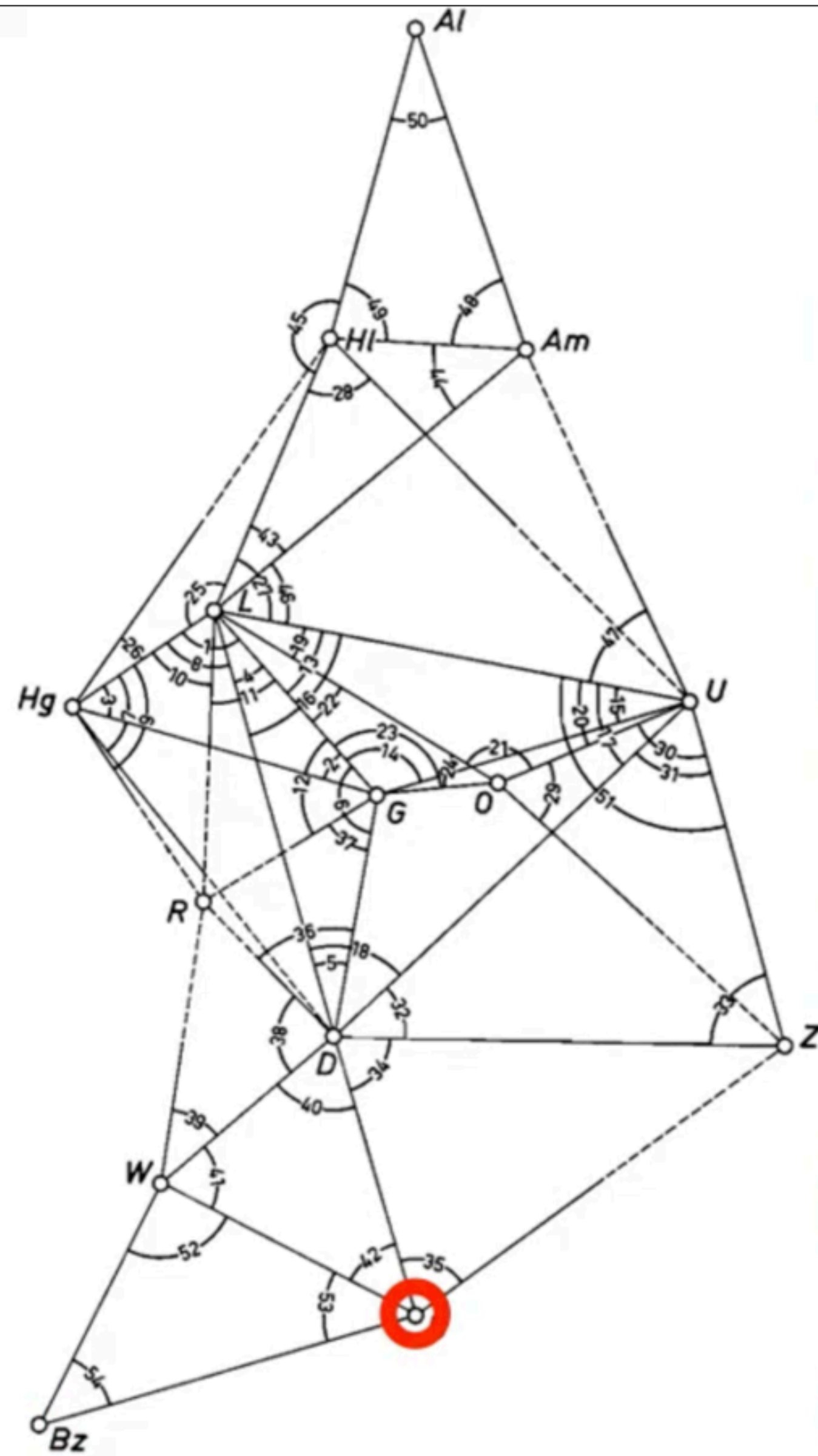


Triangulation

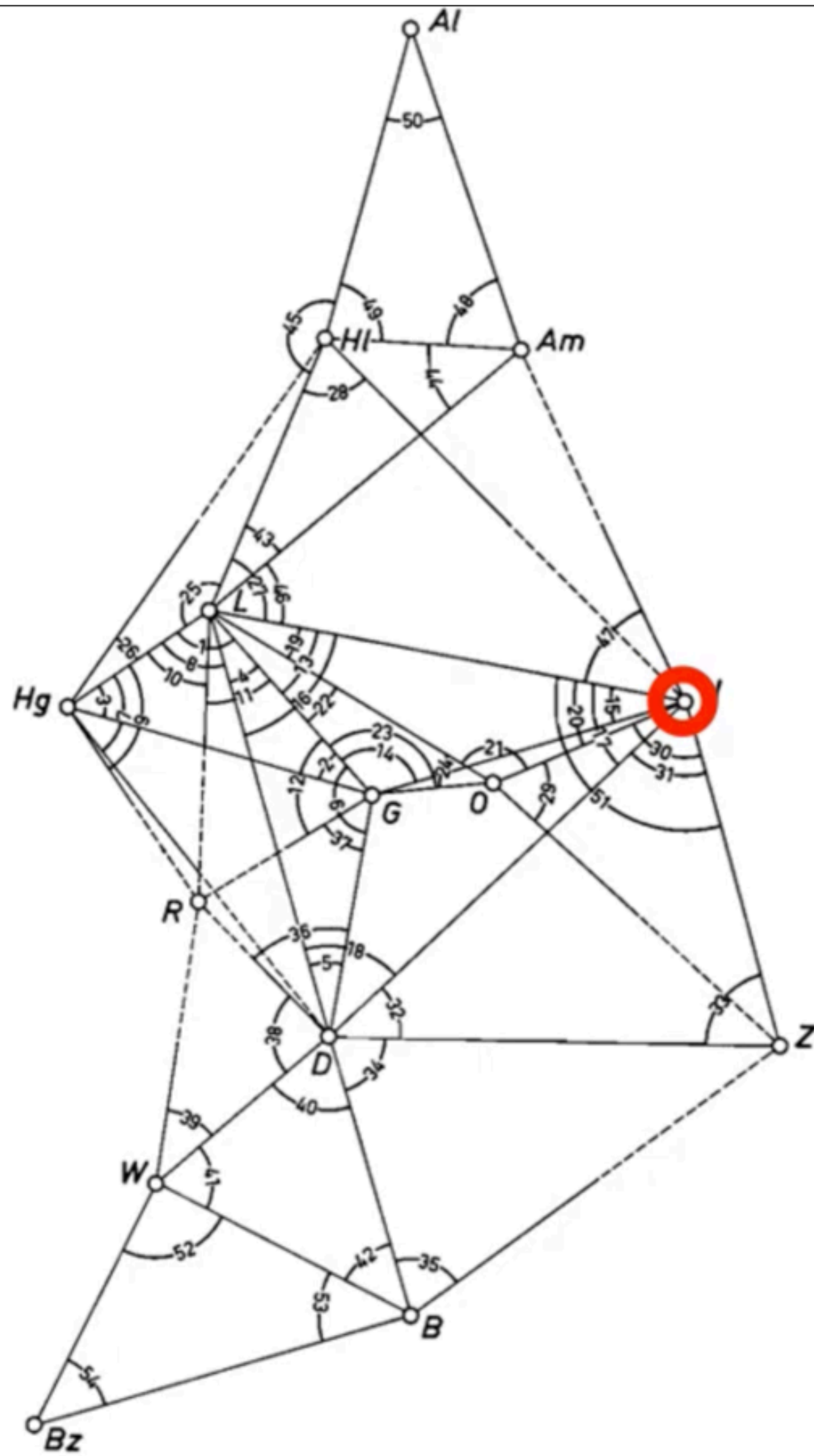
- invented by Gemma Frisius (1533)
- applied by [Willebrord Snellius](#) (famous for law of refraction)
- measured The Netherlands from Alkmaar to Bergen op Zoom (1615)



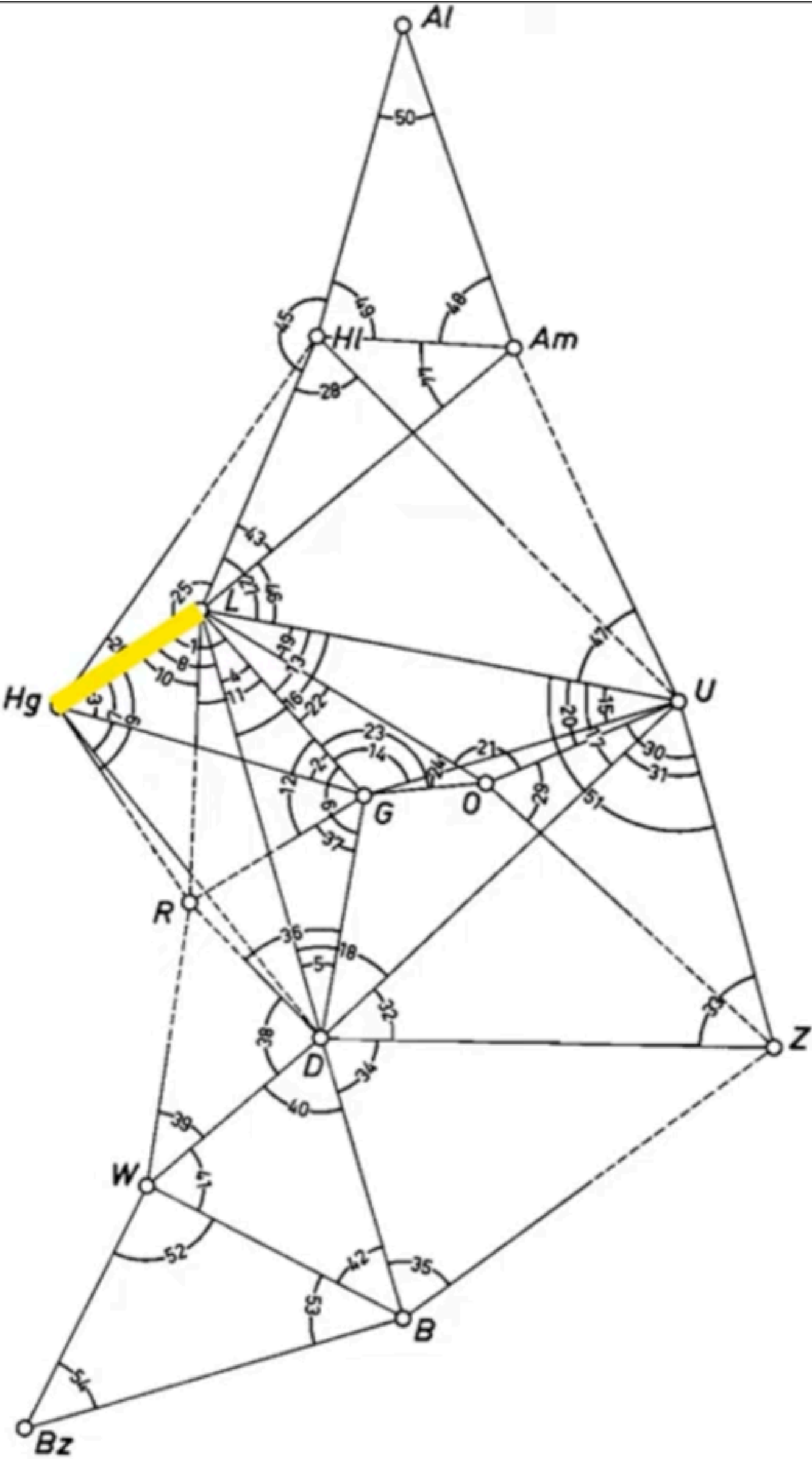
Breda: Onze Lieve Vrouwekerk



Utrecht: Domtoren



1	97° 11'	28	68° 04'
2	32 25	29	65 25
3	50 23	30	82 31
4	25 49	31	62 13
5	25 50	32	44 20
6	128 22	33	73 29
7	85 51	34	72 15
8	71 31	35	70 14
9	90 18	36	54 12
10	53 40	37	48 15
11	43 36	38	86 19
12	80 00	39	41 10
13	37 40	40	66 11
14	114 48	41	67 51
15	27 32	42	45 59
16	63 26	43	27 11
17	54 08	44	43 18
18	62 28	45	172 11
19	20 26	46	50 38
20	33 53	47	54 00
21	125 43	48	67 45
22	17 23	49	77 55
23	125 42	50	34 22
24	36 53	51	116 23
25	147 19	52	89 25
26	20 45	53	43 24
27	77 50	54	47 15



A New Map of the
UNITED PROVINCES
 or
NETHERLANDS &c
 By Herman Moll Geographer.

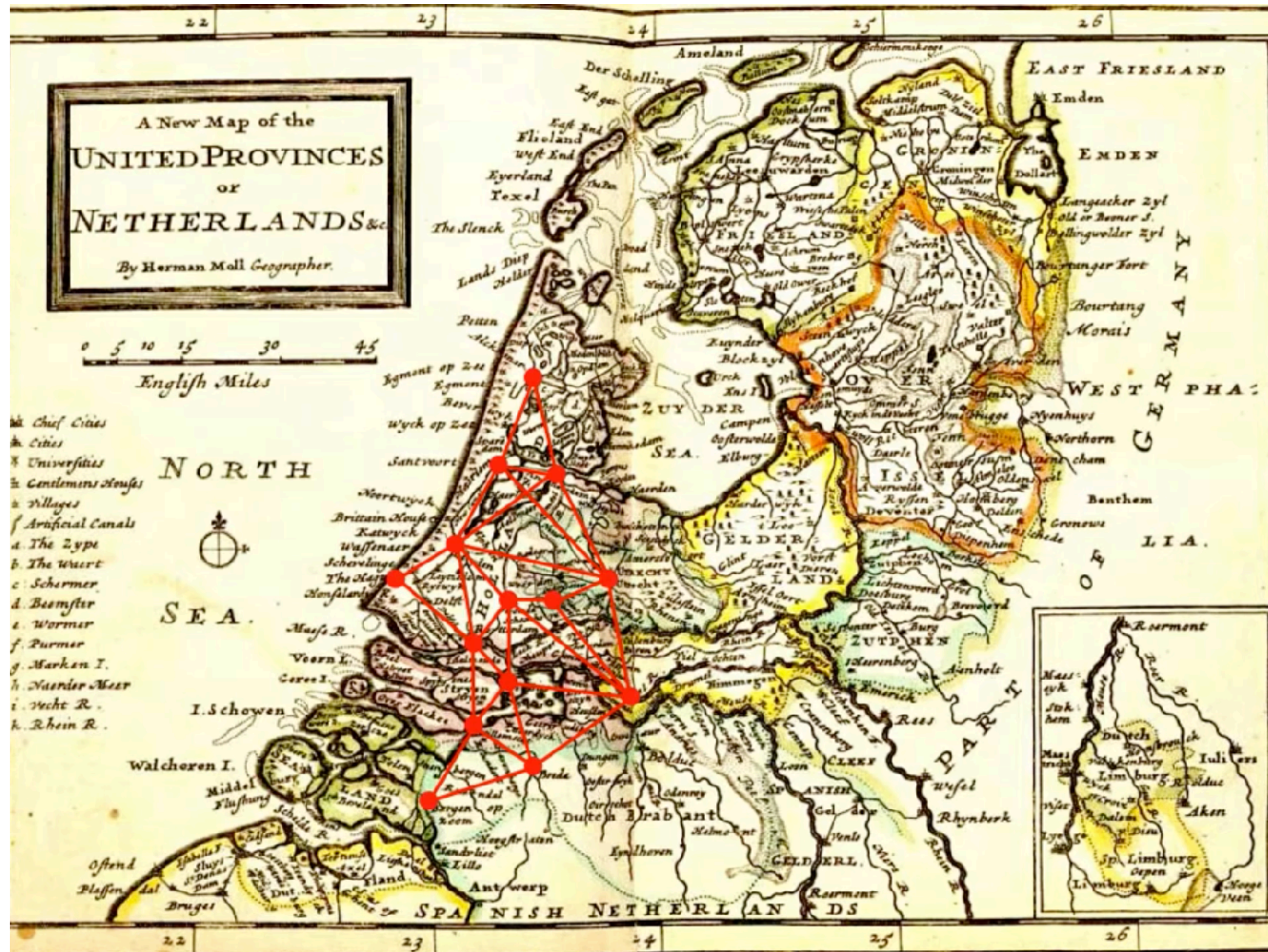
0 5 10 15 30 45
 English Miles

- Chief Cities
 Cities
 Universities
 Gentlemen Houses
 Villages
 Artificial Canals
 The Zype
 The Waert
 Schermer
 Beemster
 Wormer
 Purmer
 Marken I.
 Naarder Meer
 Vecht R.
 Rhein R.

NORTH



SEA.



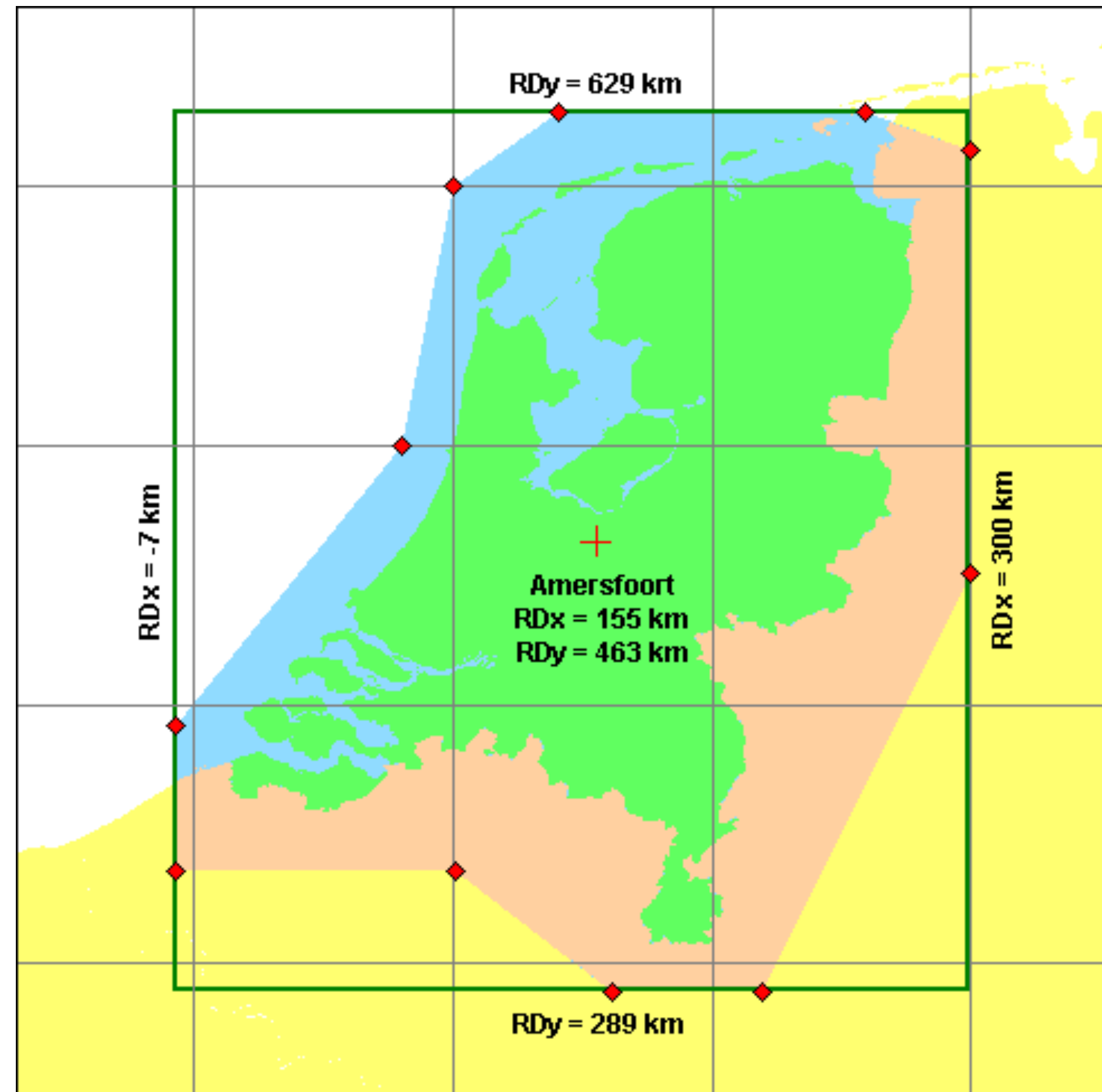
Triangulation

- Snellius (1615)
- Diederik Jekel measures it again ([television series](#))



Rijksdriehoekskoördinaten

- “Amersfoort coördinaten”
- **1918** - introductie
- **1968** - relocatie of (0,0)



Rijksdriehoekskoördinaten

- “Amersfoort coördinaten”
- oorsprong was in Amersfoort
- spire of Onze Lieve Vrouwetoren



Rijksdriehoekskoördinaten

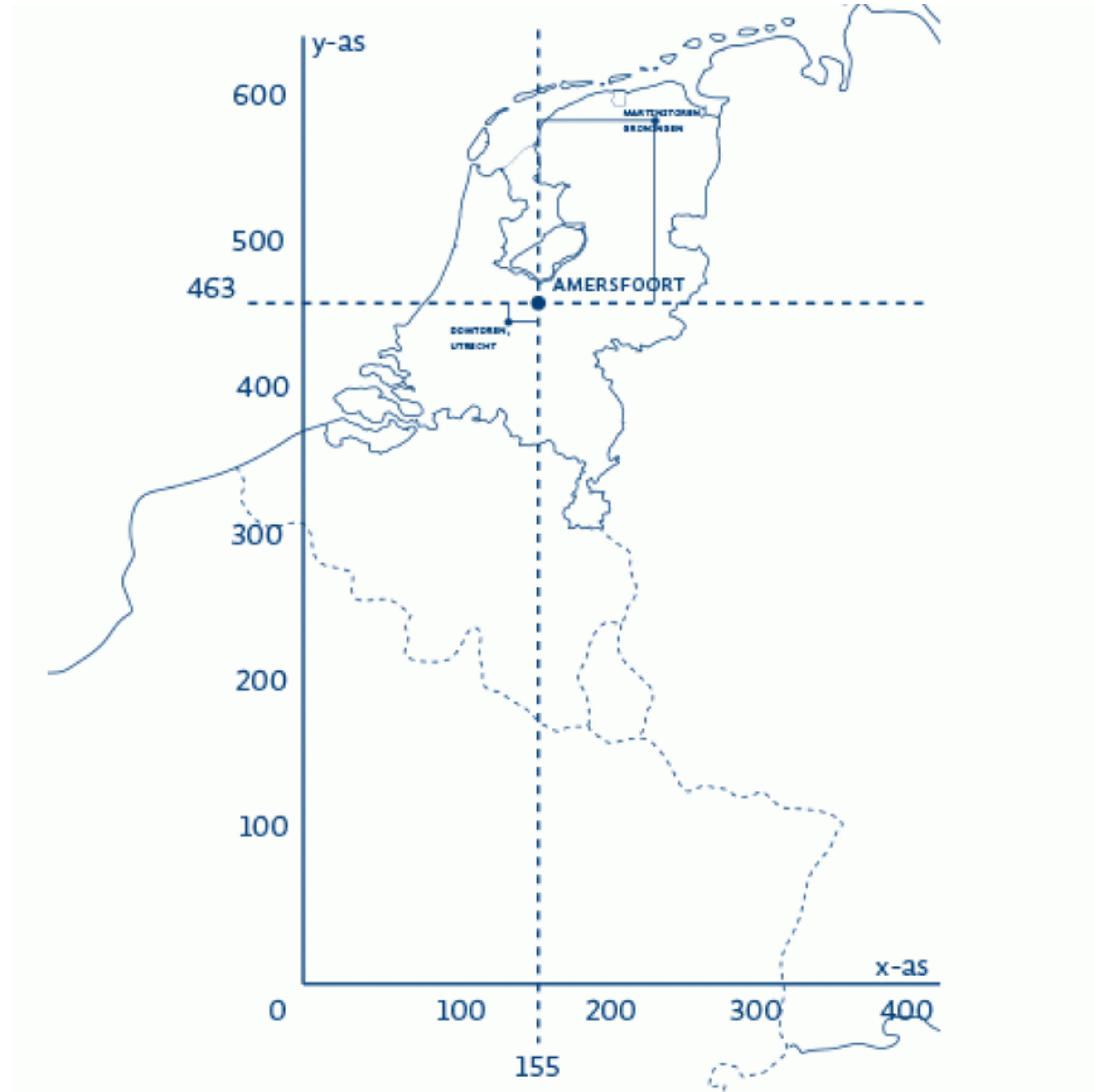
- “Amersfoort coördinaten”
- oorsprong was in Amersfoort
- Onze Lieve Vrouwetoren



Rijksdriehoekskoördinaten

- (x, y) in **meters**
- oorsprong $(0, 0)$ is nu 120 km ten zuidoosten van Parijs
- x altijd kleiner dan y !

Rijksdriehoekskoördinaten



Rijksdriehoekscoördinaten

- alle basisregistraties gebruiken RD coördinaten
- zie PDOK viewer <https://app.pdok.nl/viewer/>
- <https://www.kadaster.nl/zakelijk/registraties/basisregistraties/rijksdriehoeksmeting/rijksdriehoeksstelsel>

Normaal Amsterdams Peil

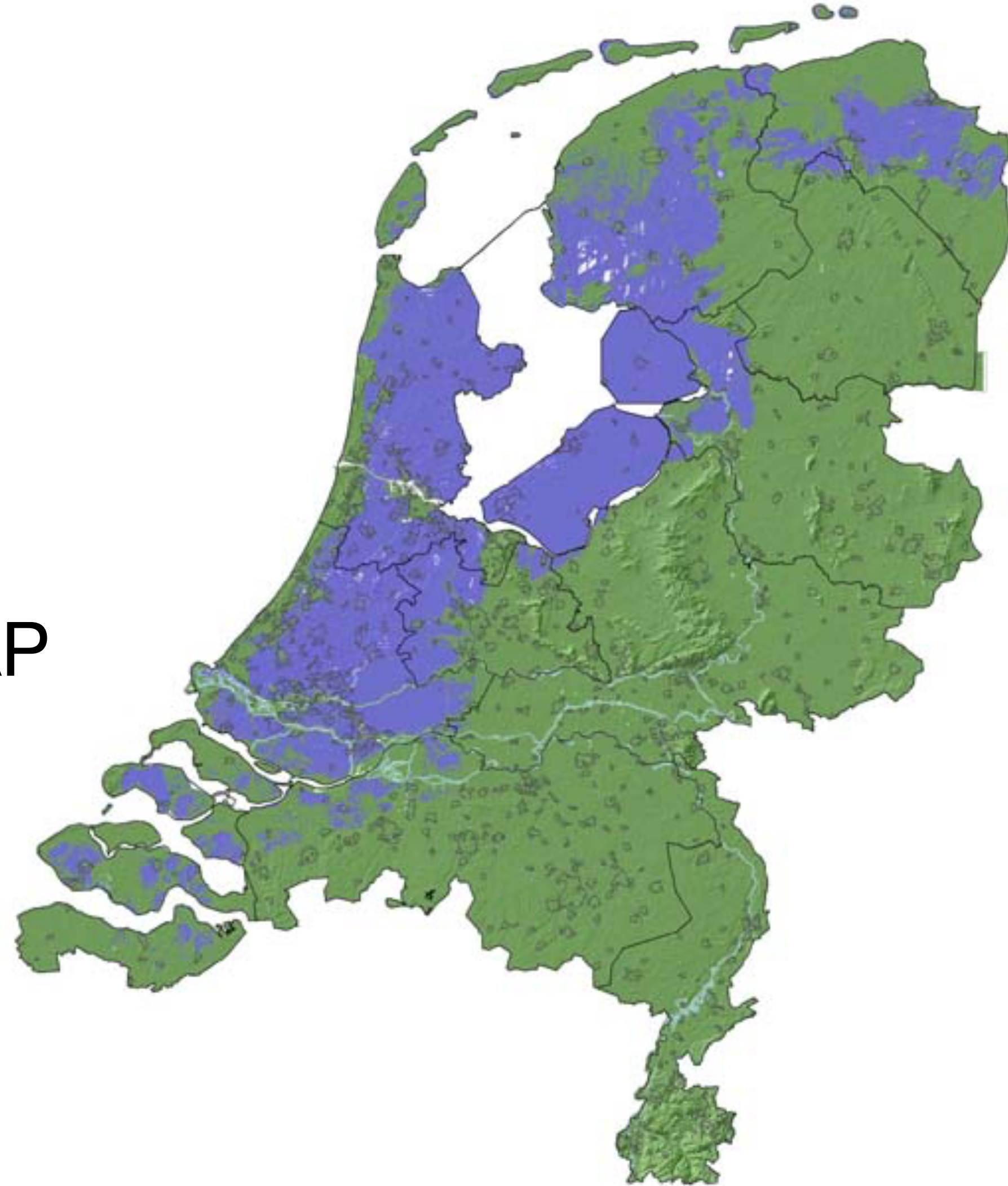


Normaal Amsterdams Peil

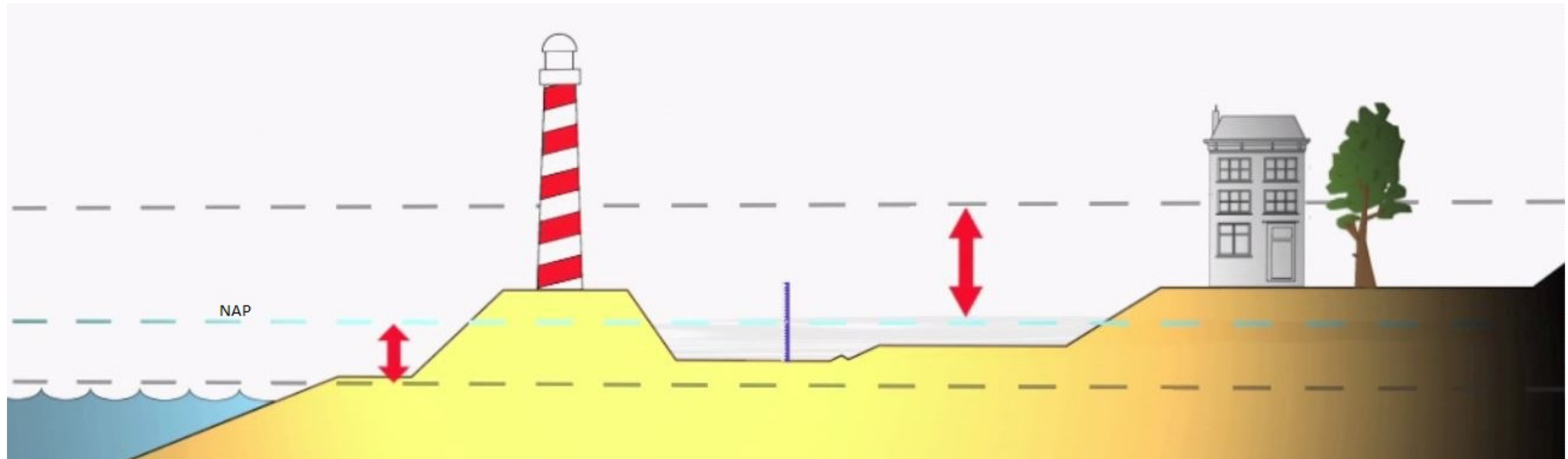
- zero-point: ~ mean sea level (North Sea)
- zero-point: under Dam Square (1955 - 2004)
- 50.000 'peilmerken' around The Netherlands

Normaal Amsterdams Peil

- blue: below NAP
- green: above NAP



Normaal Amsterdams Peil



Normaal Amsterdams Peil

- zero is *under* Dam Square
- plate was at
 - 1.4278 m above NAP
 - “0” since 1955
- plate is at
 - 1.4080 m above NAP
 - no longer “0” since 2004



Lowest Astronomical Tide

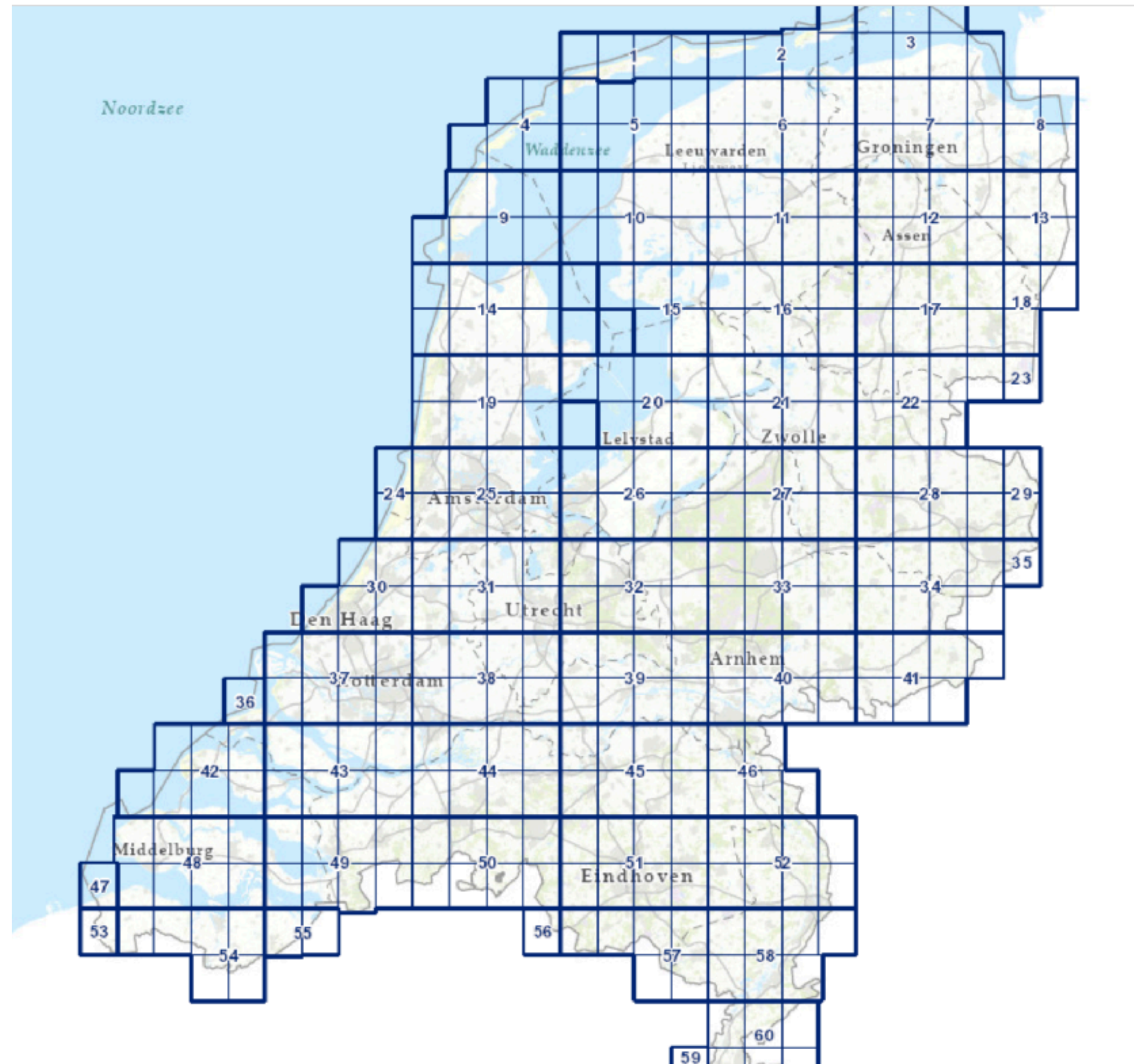
- international equivalent of N.A.P.
- in harbours: Approximate LAT
- adhered to by
 - Port of Rotterdam (2022)
 - IJmuiden (2025)

Peilmerken



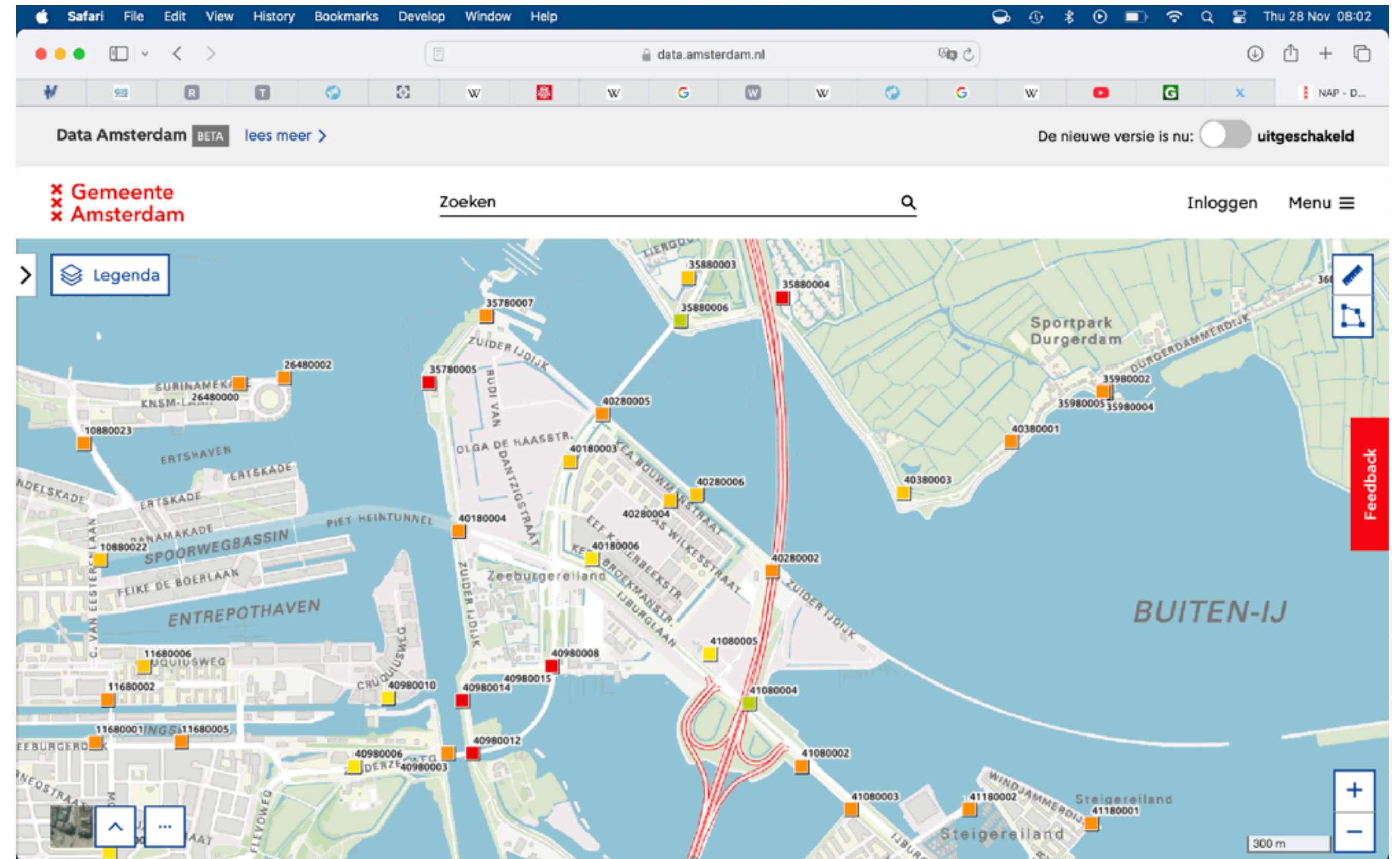
Peilmerken

- Rijkswaterstaat



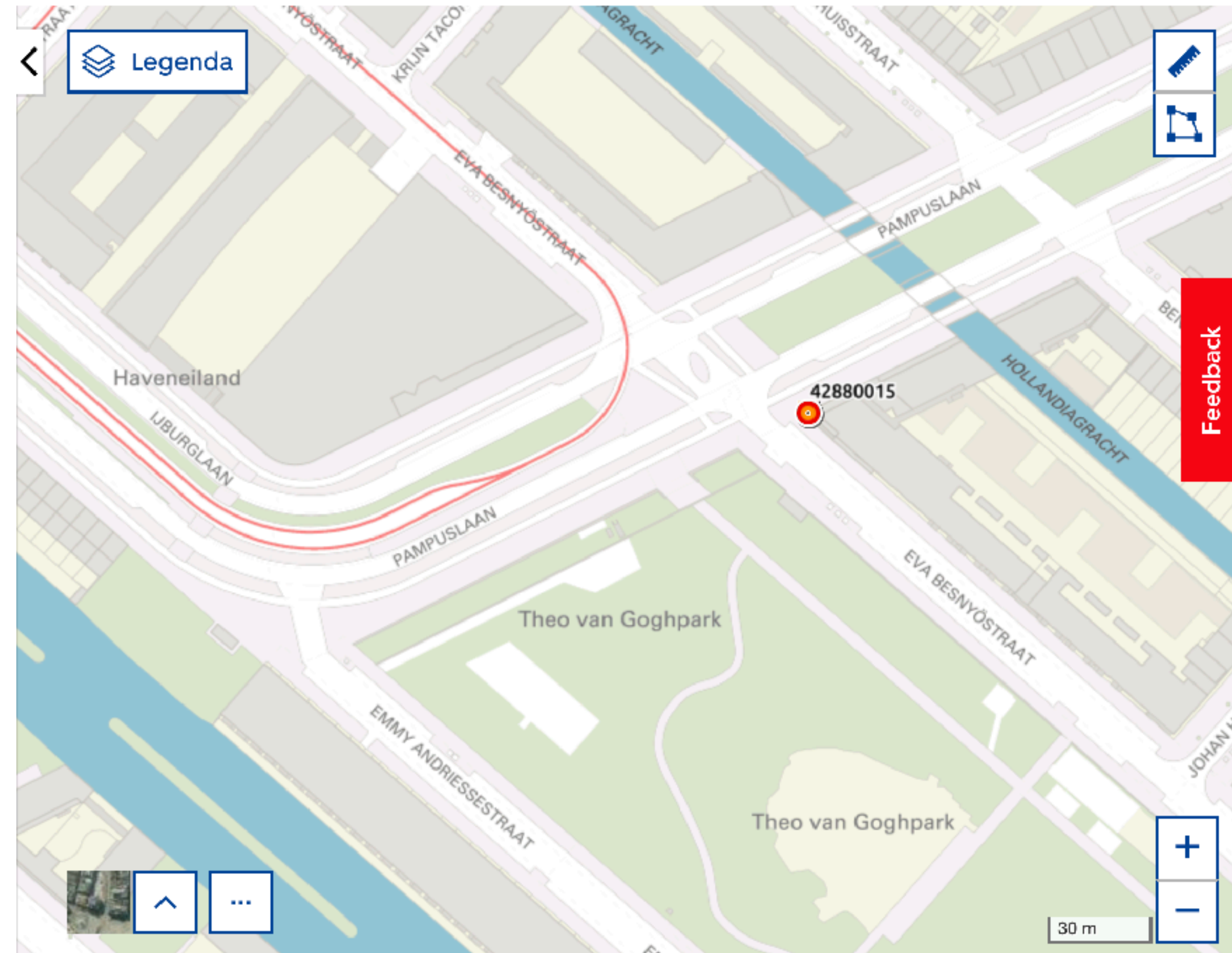
Peilmerken map

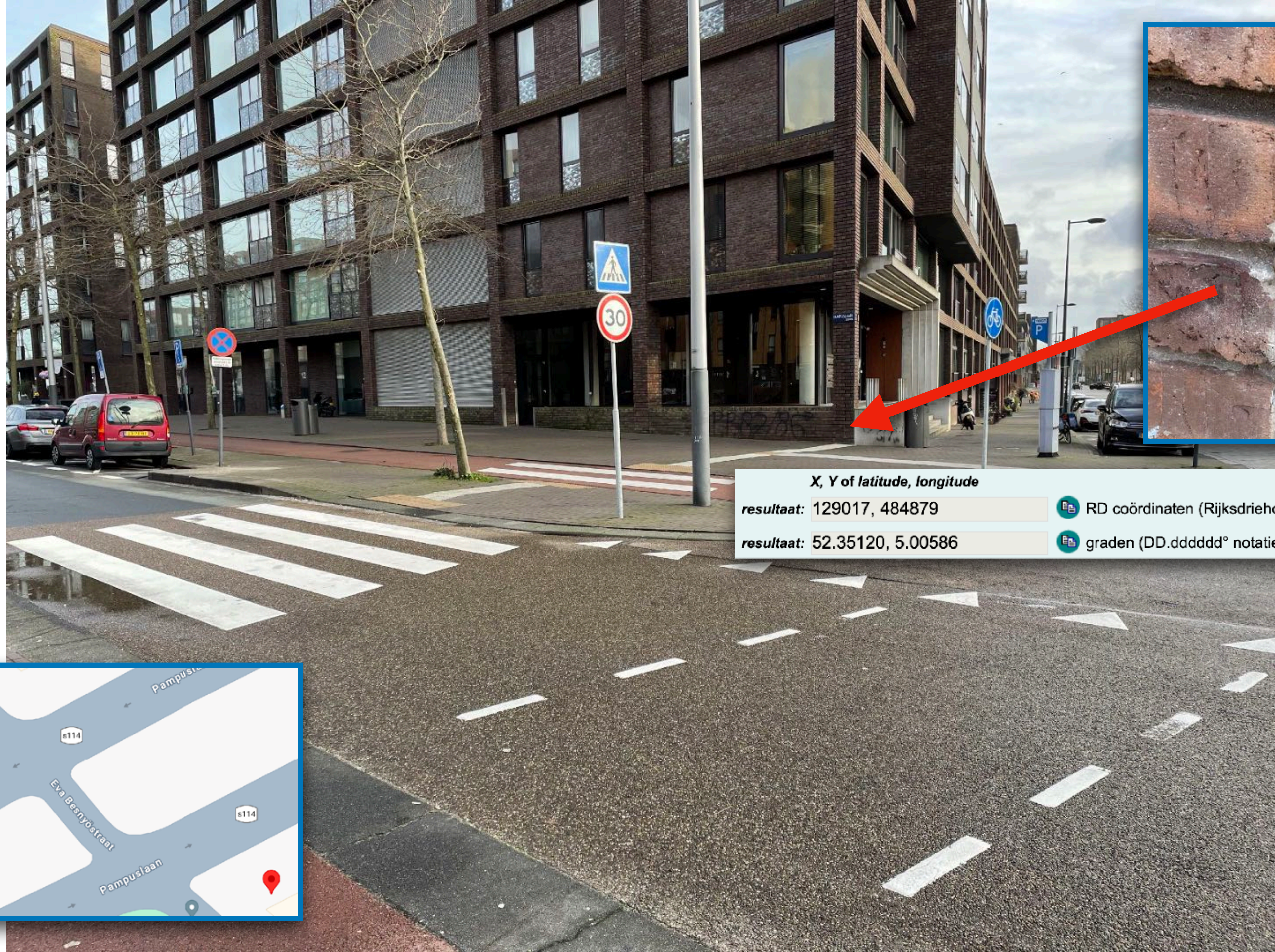
- <https://data.amsterdam.nl/>



Peilmerk 42880015

- RD coördinaten
 - 129017, 484879
- GPS coördinaten
 - 52.35120, 5.00586
- NAP height: 3.4766 m





X, Y of latitude, longitude

resultaat: 129017, 484879

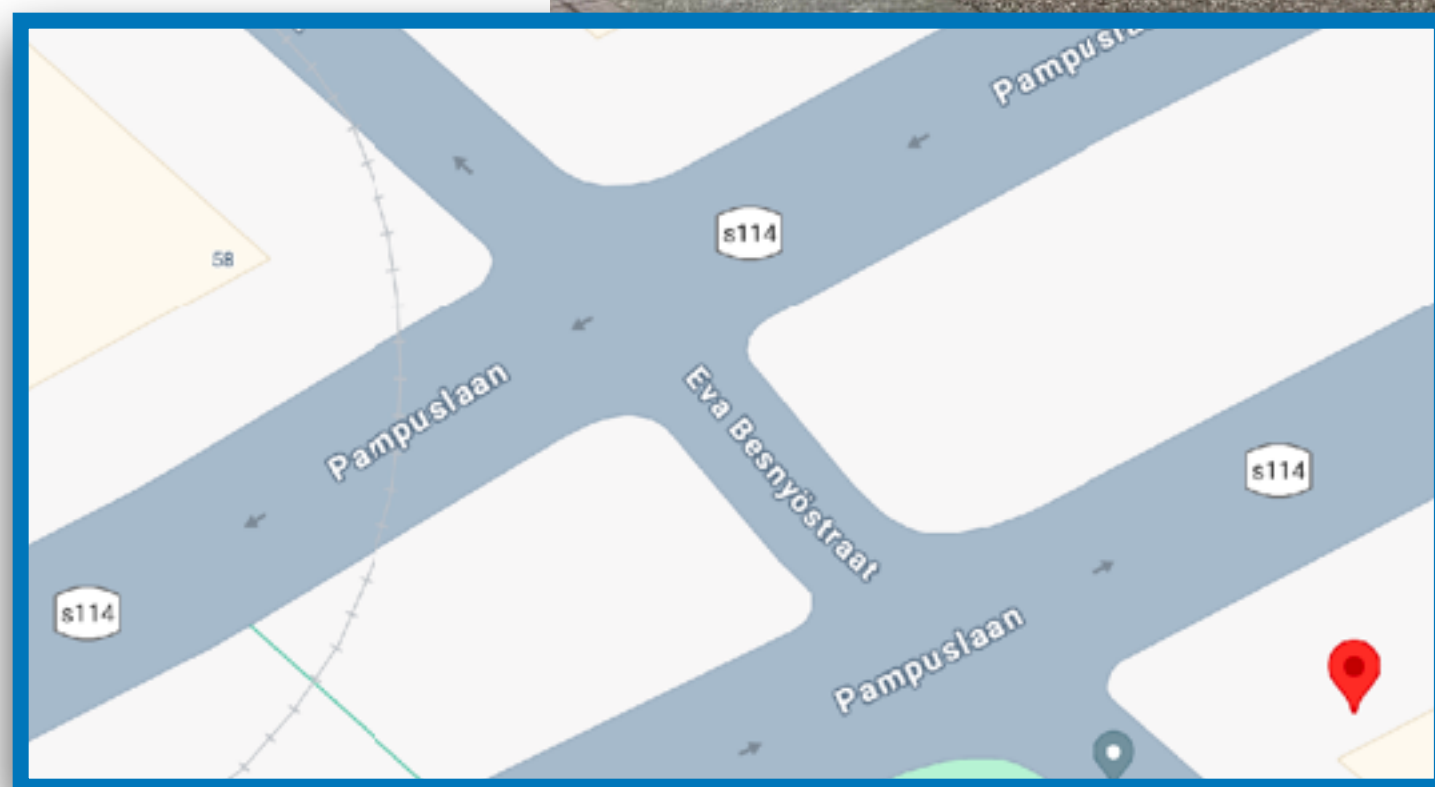
 RD coördinaten (Rijksdriehoeksmeting X,Y in meters)

resultaat: 52.35120, 5.00586

 graden (DD.dddd° notatie)

peilmerk
42880015

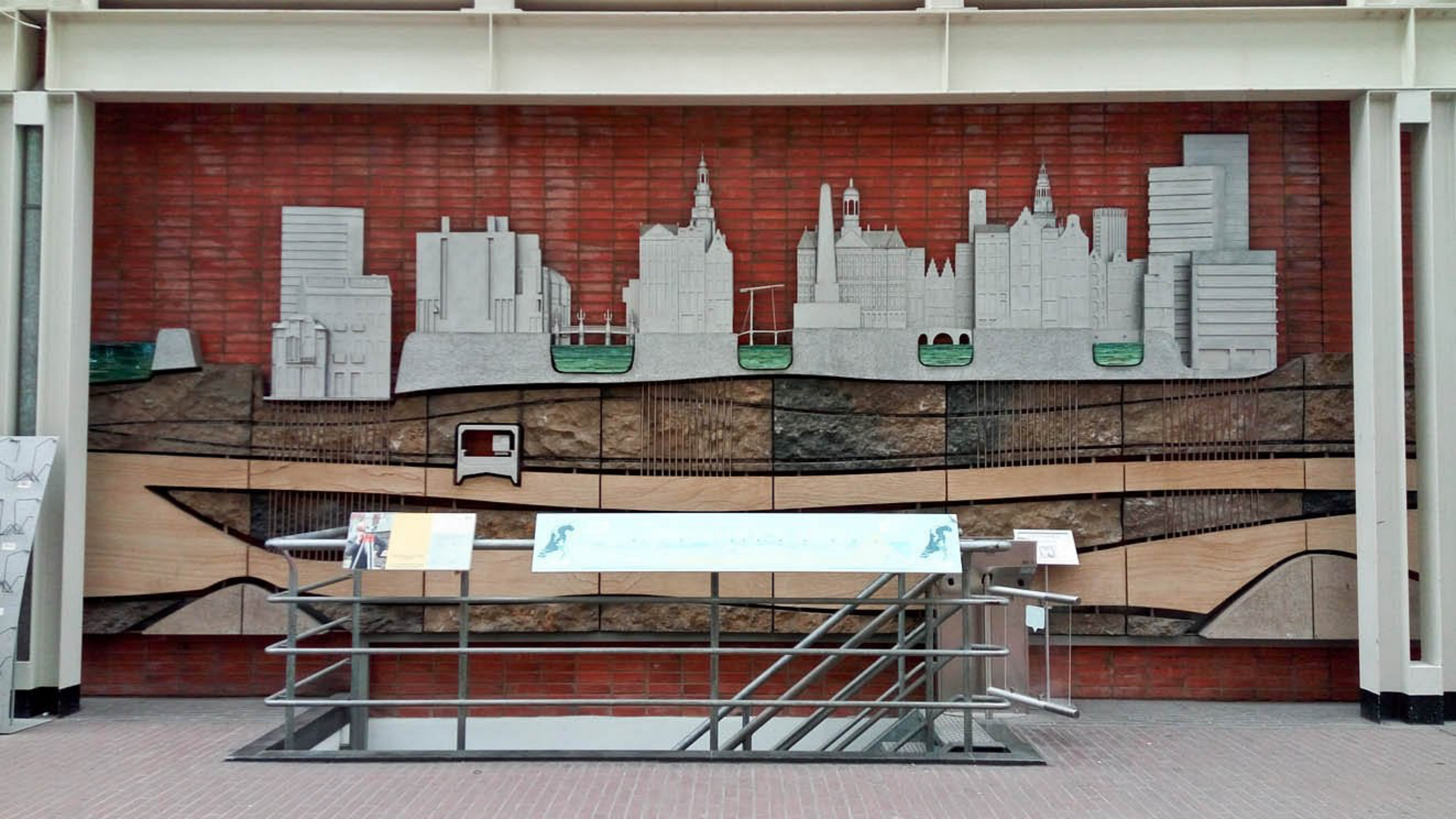
NAP
height
3.4766 m



Exhibition

<https://www.normaalamsterdamspeil.nl/>

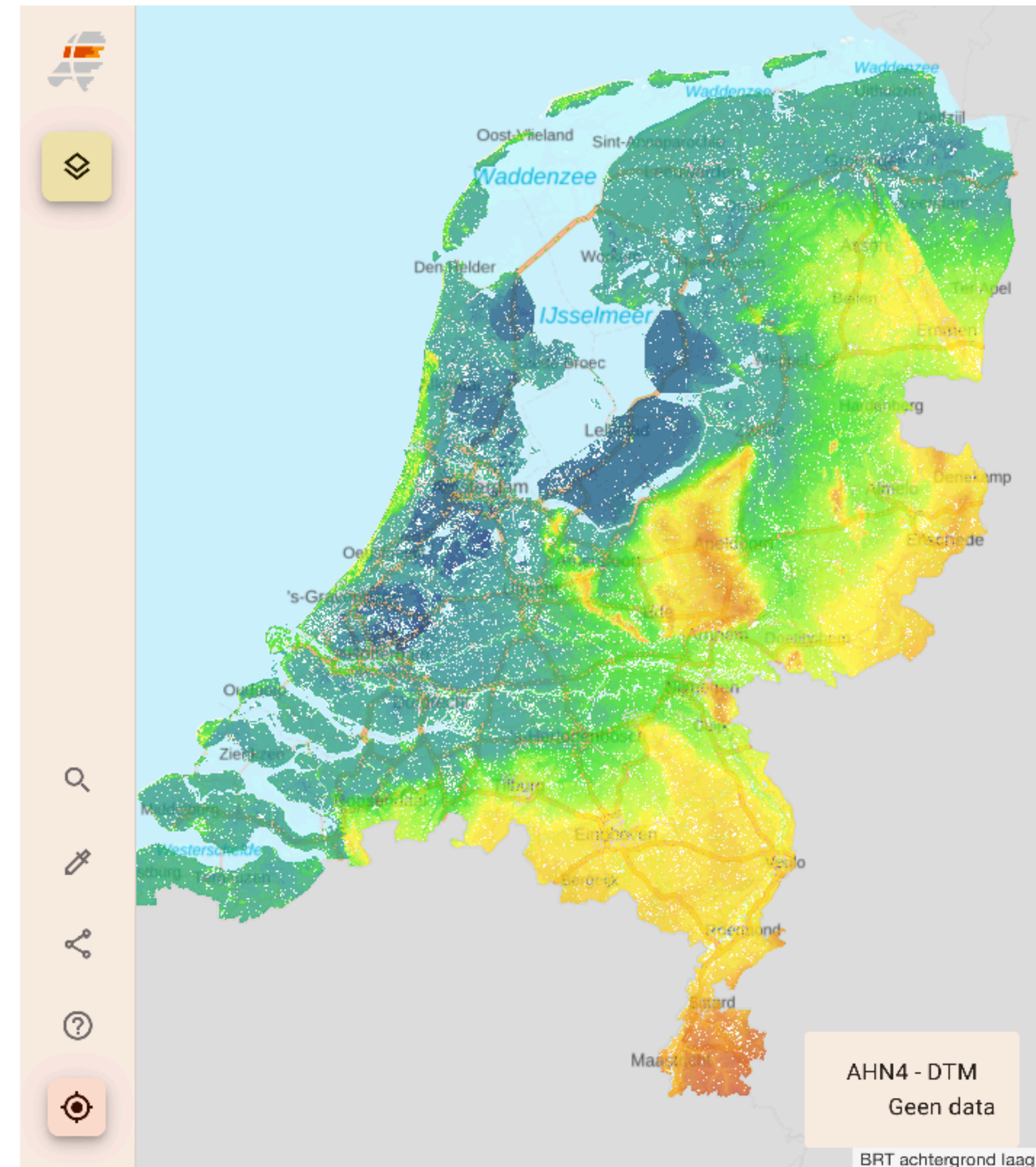




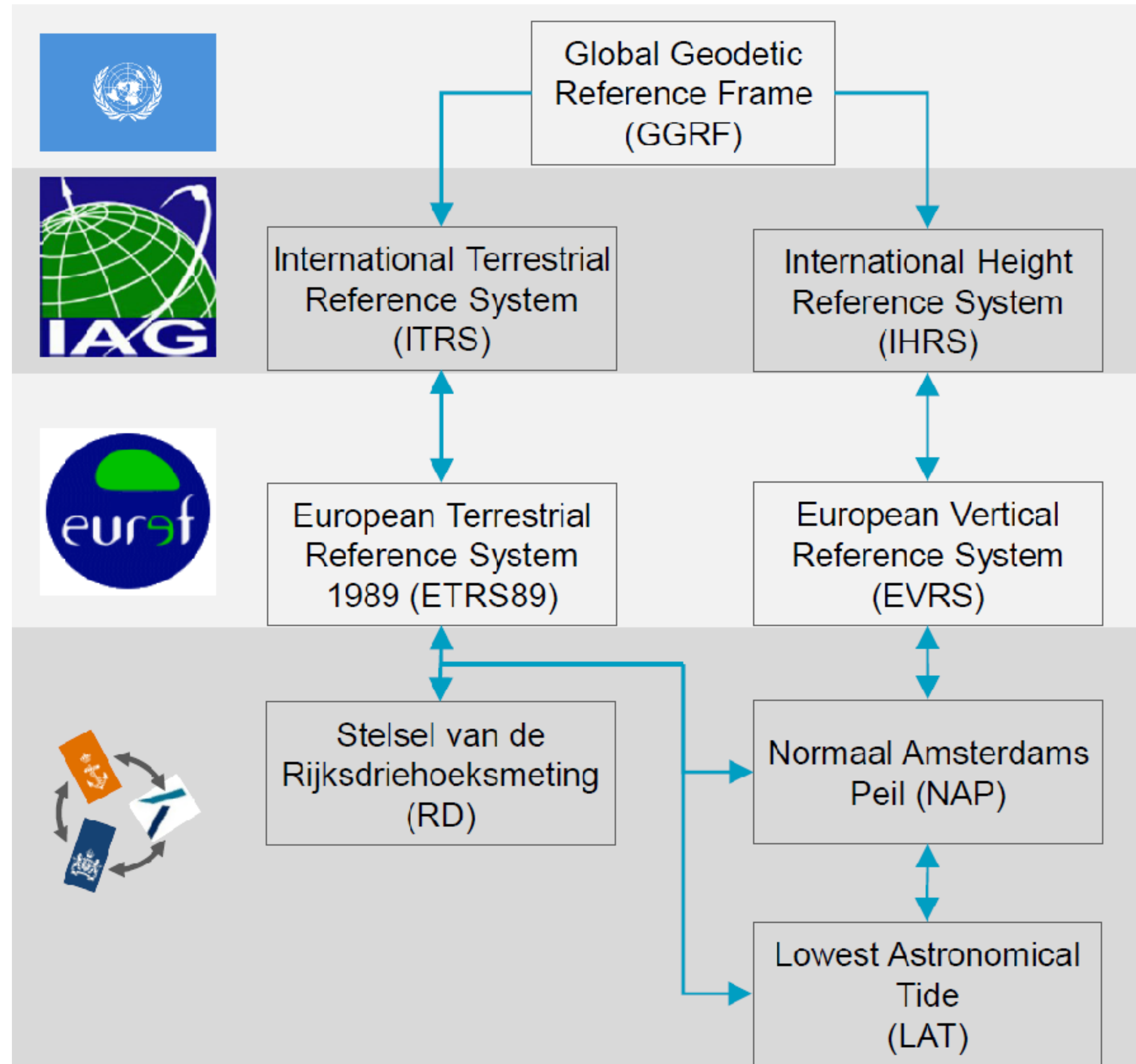


Actueel Hoogtebestand Nederland (AHN)

- <https://www.ahn.nl/ahn-viewer>



RD, NAP → internationale stelsels





[Terug naar vorige pagina](#)

RDNAPTRANS

RDNAPTRANS™ is de officiële en nauwkeurige transformatie tussen:

- het stelsel van de Rijksdriehoeksmeting (RD) met hoogte ten opzichte van het Normaal Amsterdams Peil (NAP)
- het European Terrestrial Reference System 1989 (ETRS89)

De huidige versie is RDNAPTRANS™2018.

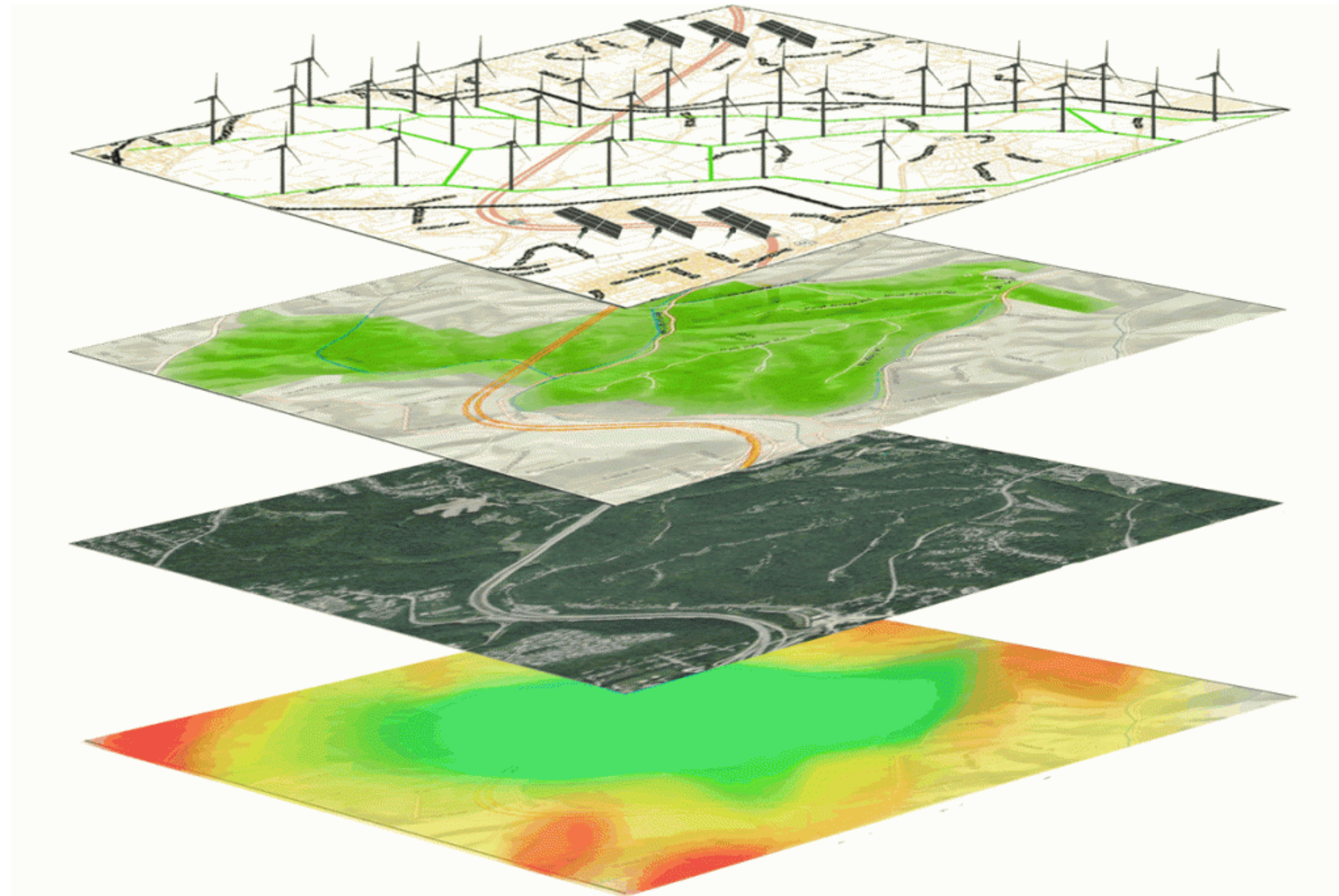
Parameters en formules RDNAPTRANS

De parameters en formules van RDNAPTRANS™ zijn vrij beschikbaar voor software-ontwikkelaars en andere belangstellenden.

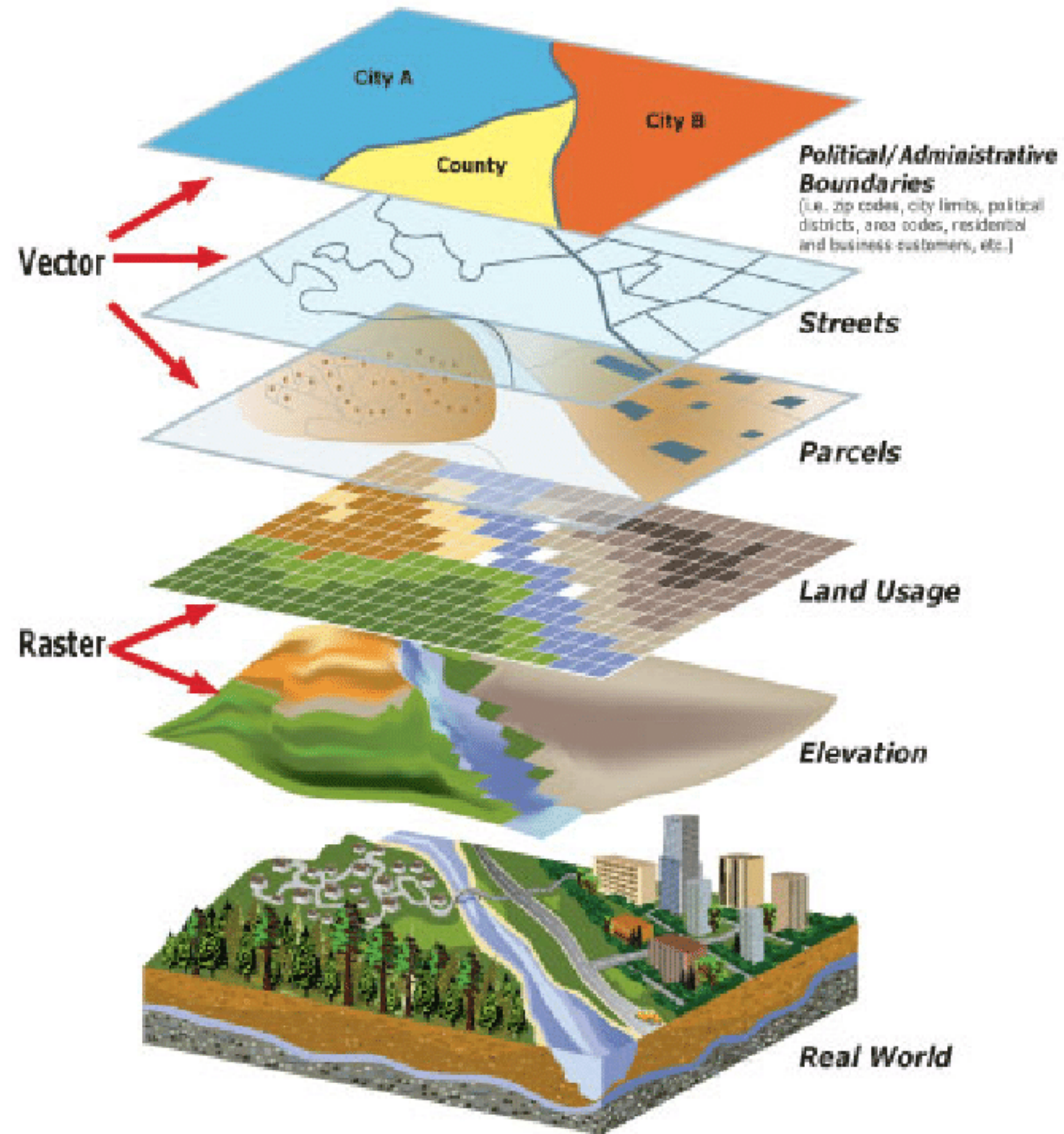
Hebt u interesse? Start de download na het invullen van het formulier [Aanvragen download RDNAPTRANS](#).

Pauze

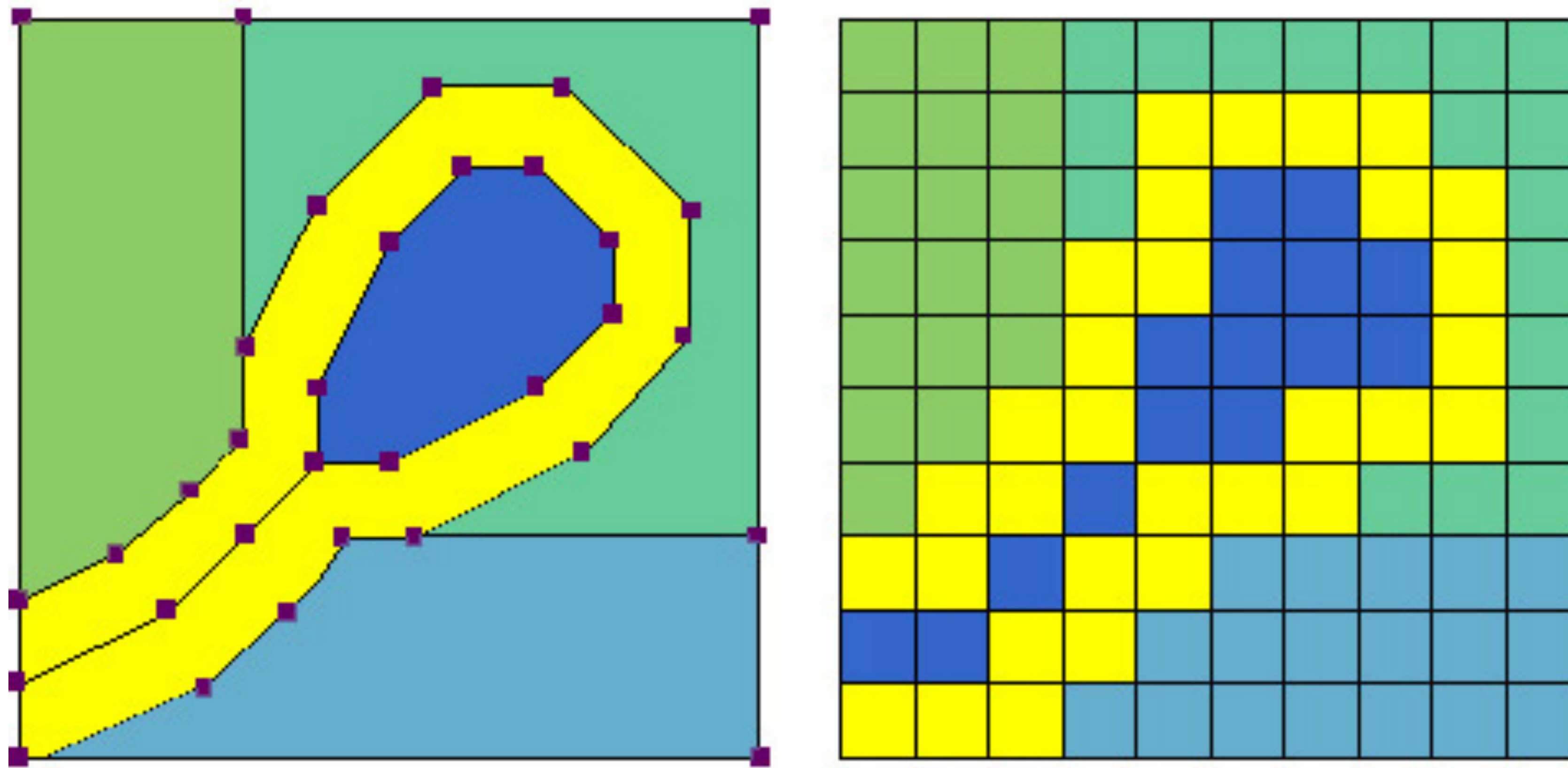
Zelf kaarten maken



Kaartlagen



Vector- en raster-lagen



Vector vs Raster

$$P = sA + (1 - s)B$$

$$P = sA + (1 - s)B$$

Vector vs Raster

$$P = sA + (1 - s)B$$

$$P = sA + (1 - s)B$$

Vector vs Raster

P = SA +

P = SA +

Vector vs Raster

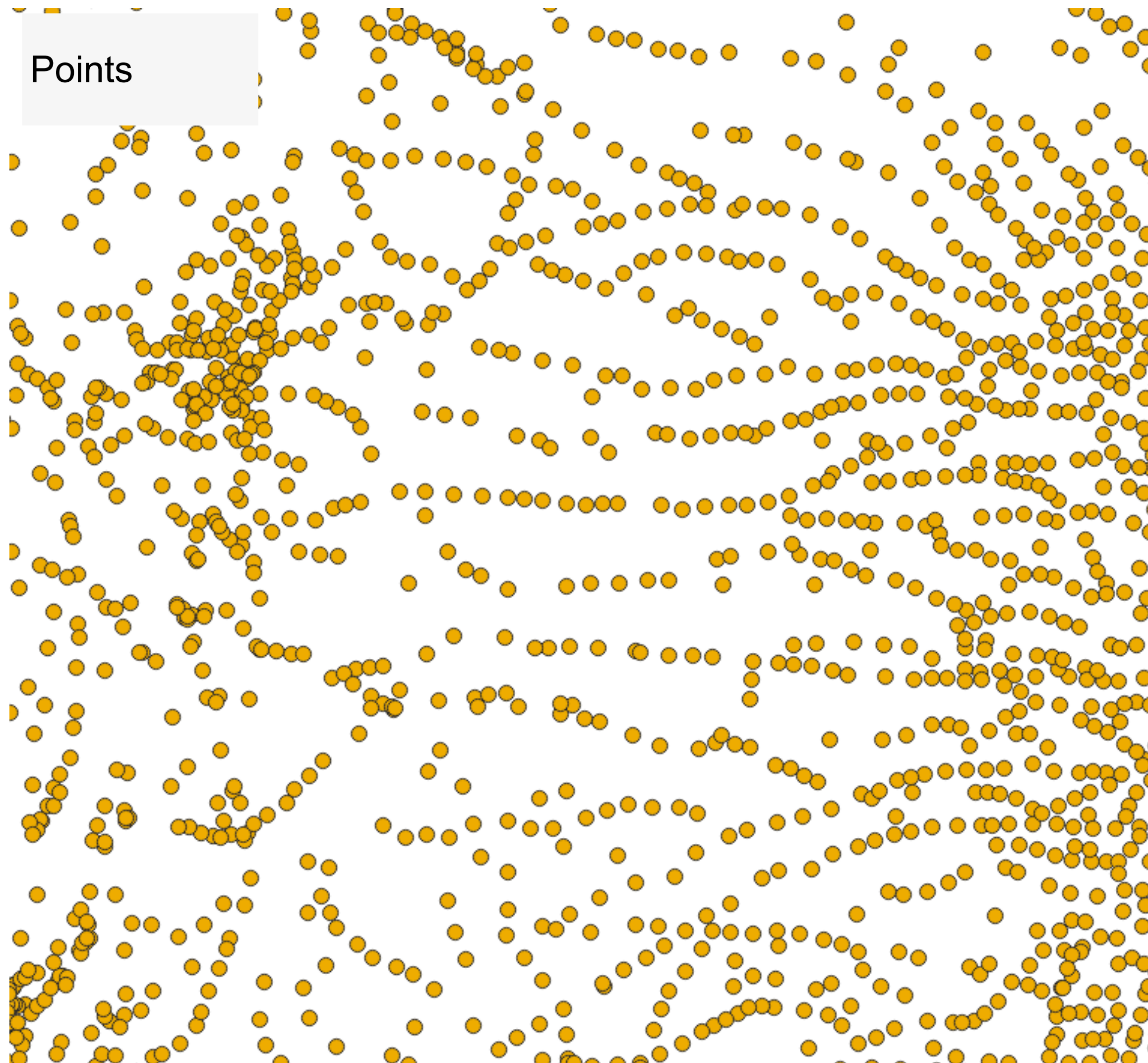
P

P

Vector lagen

- punten
- lijnen
- regio's → polygonen
- kleine datastructuren

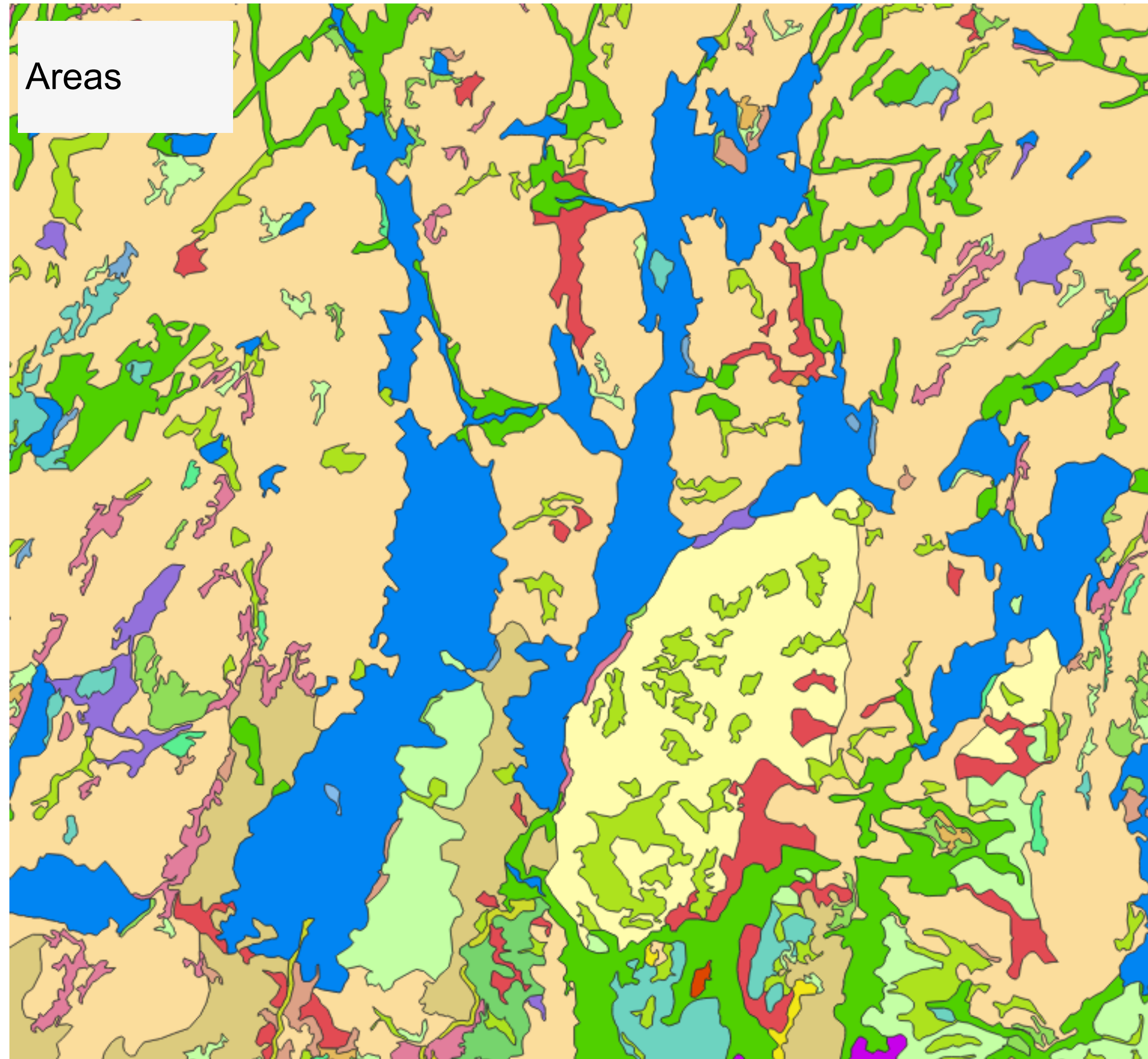
Punten



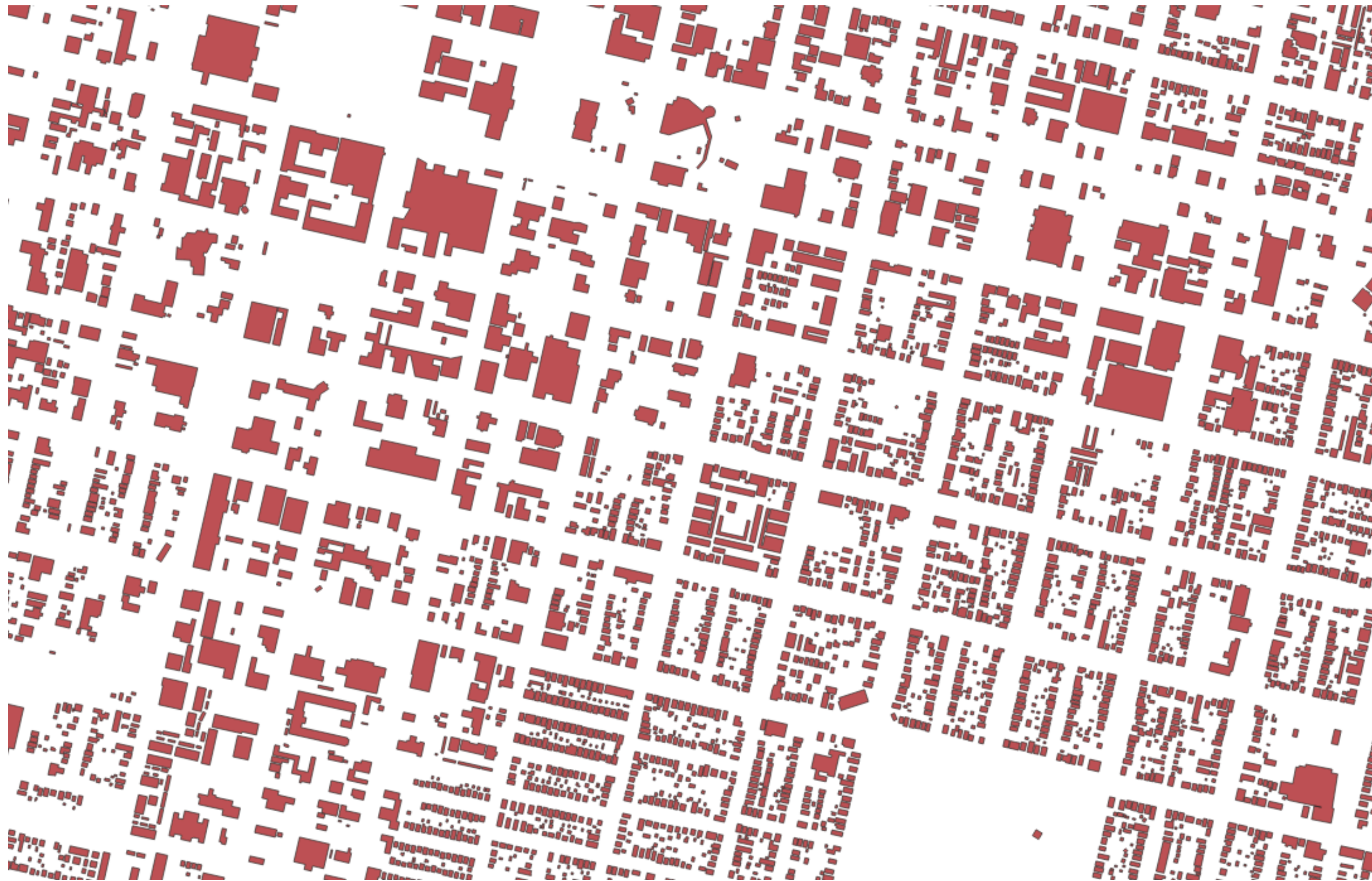
Lijnen

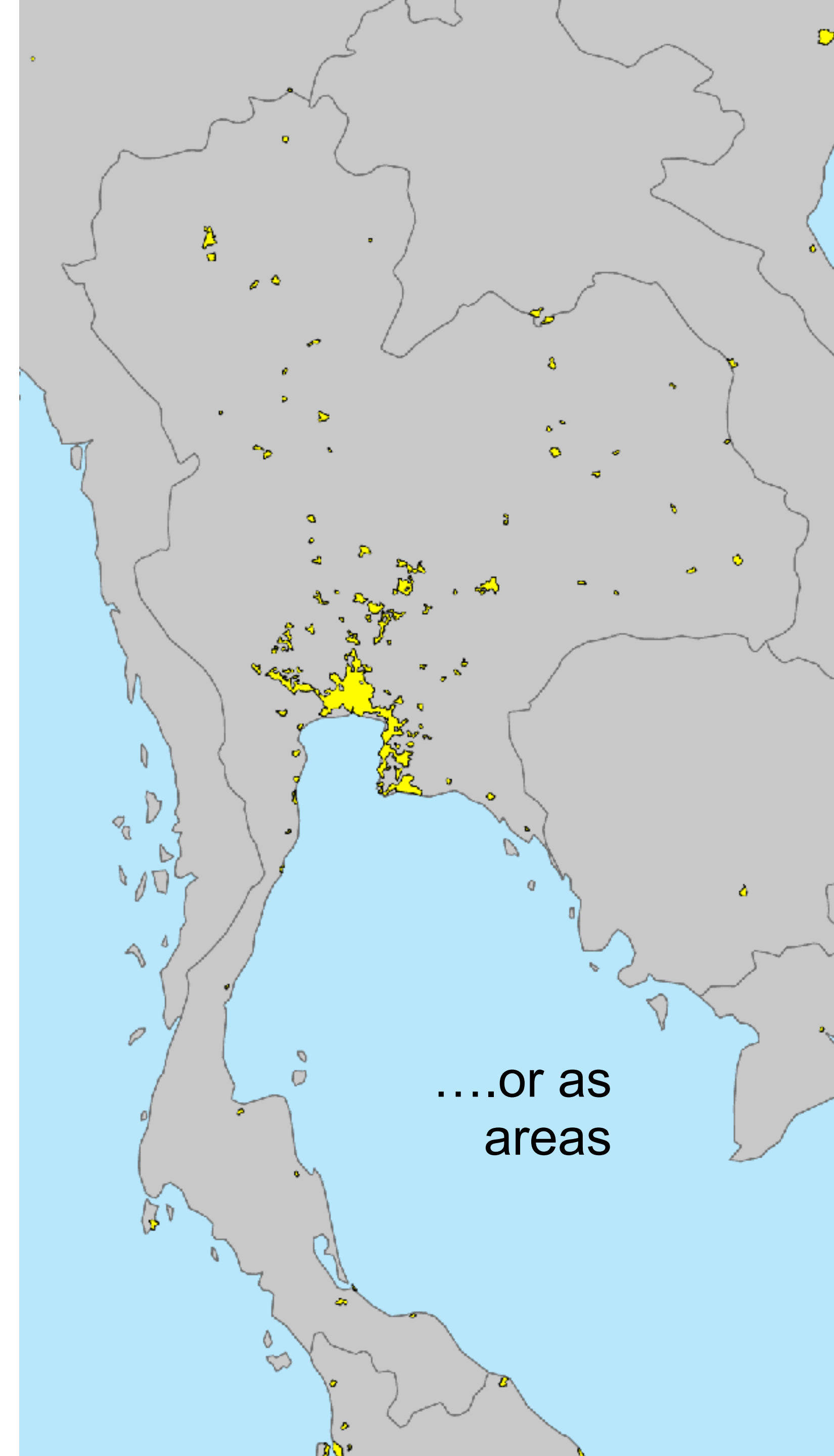
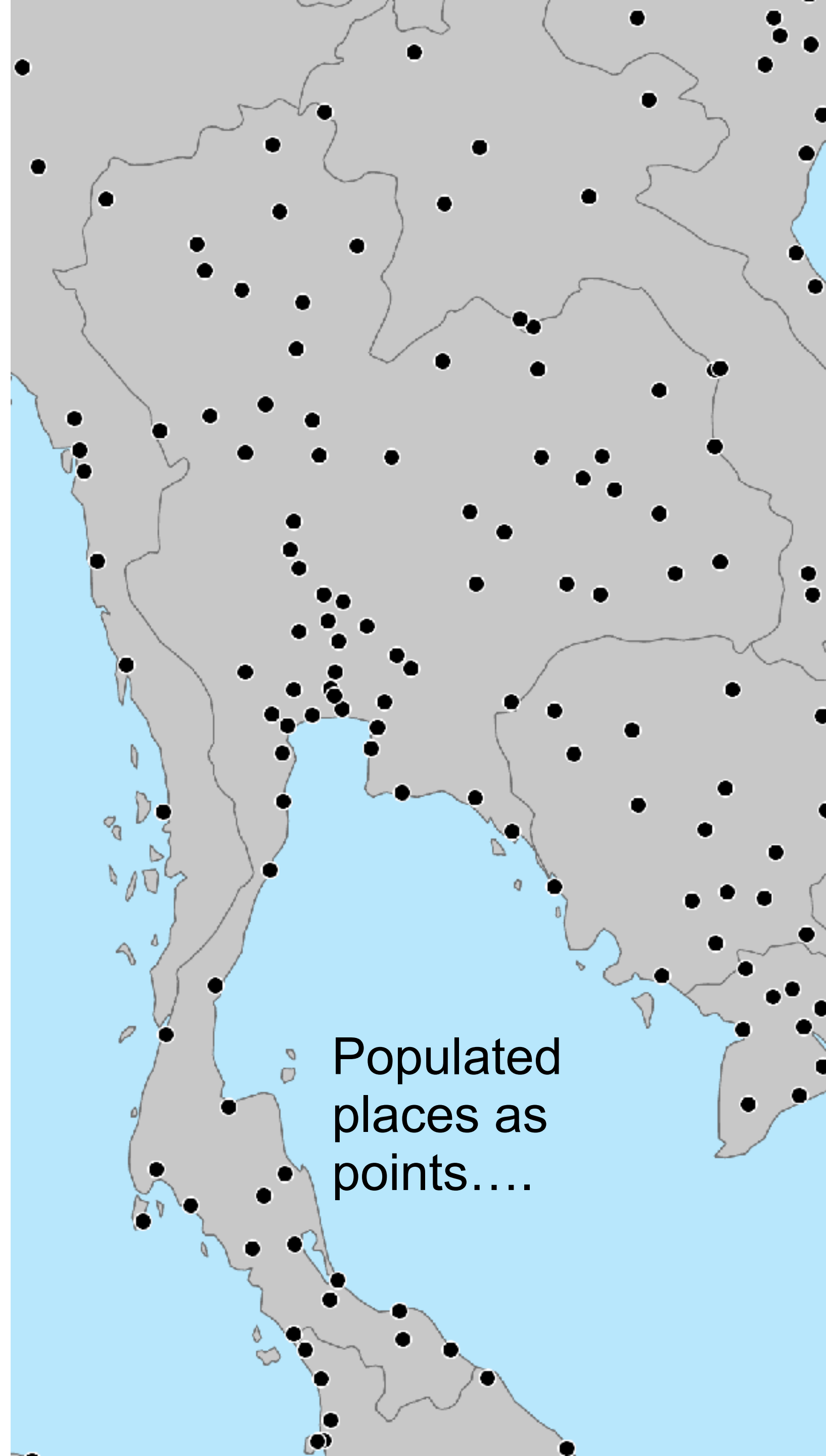


Regio's



Regio's





Roads as
lines....

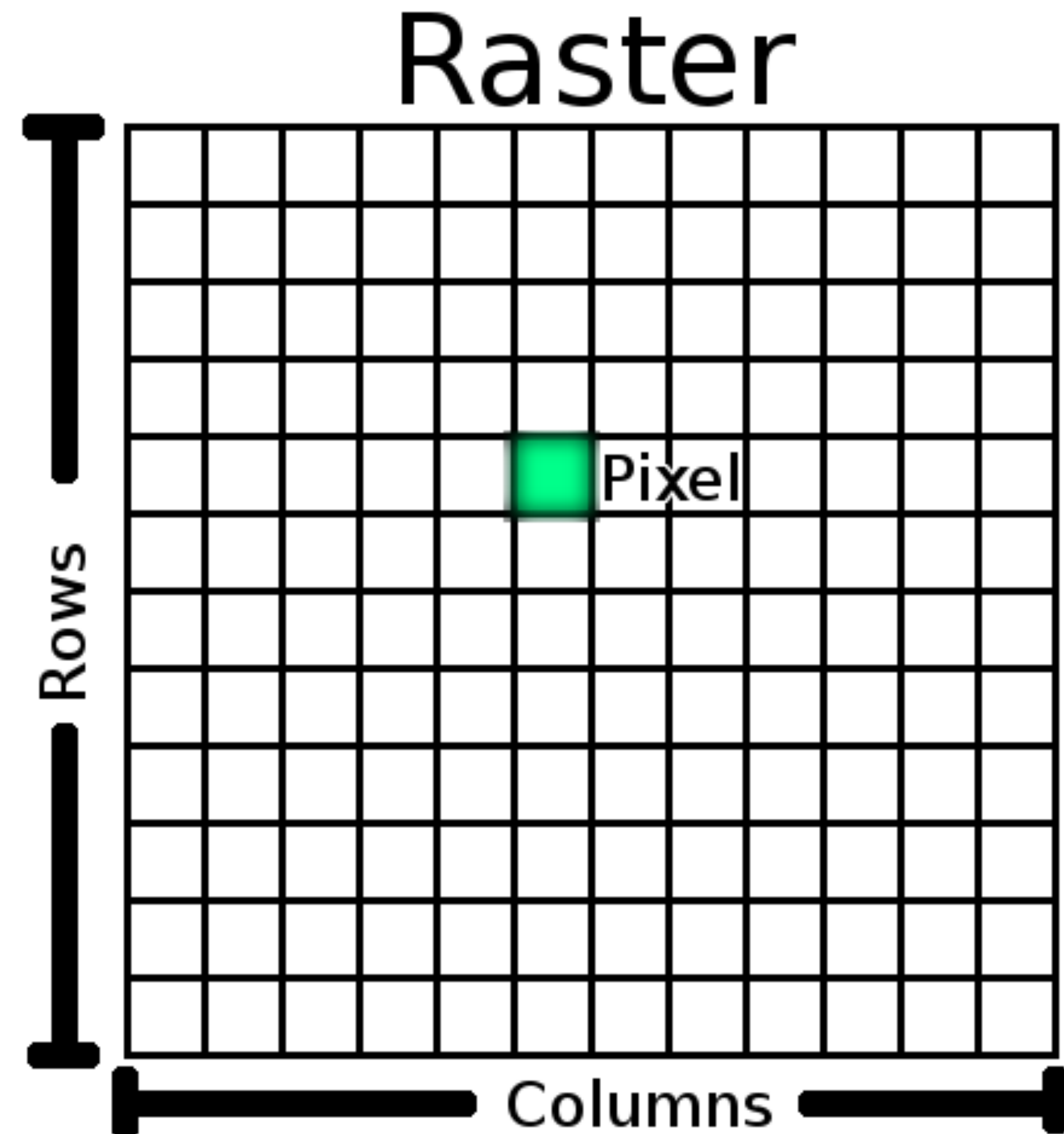
....or as
areas

Raster lagen

- “pixels” in een raster
- elke pixel heeft geografische coördinaten
- grote datastructuren

Raster lagen

- pixels (“picture elements”) georganiseerd in rijen en kolommen



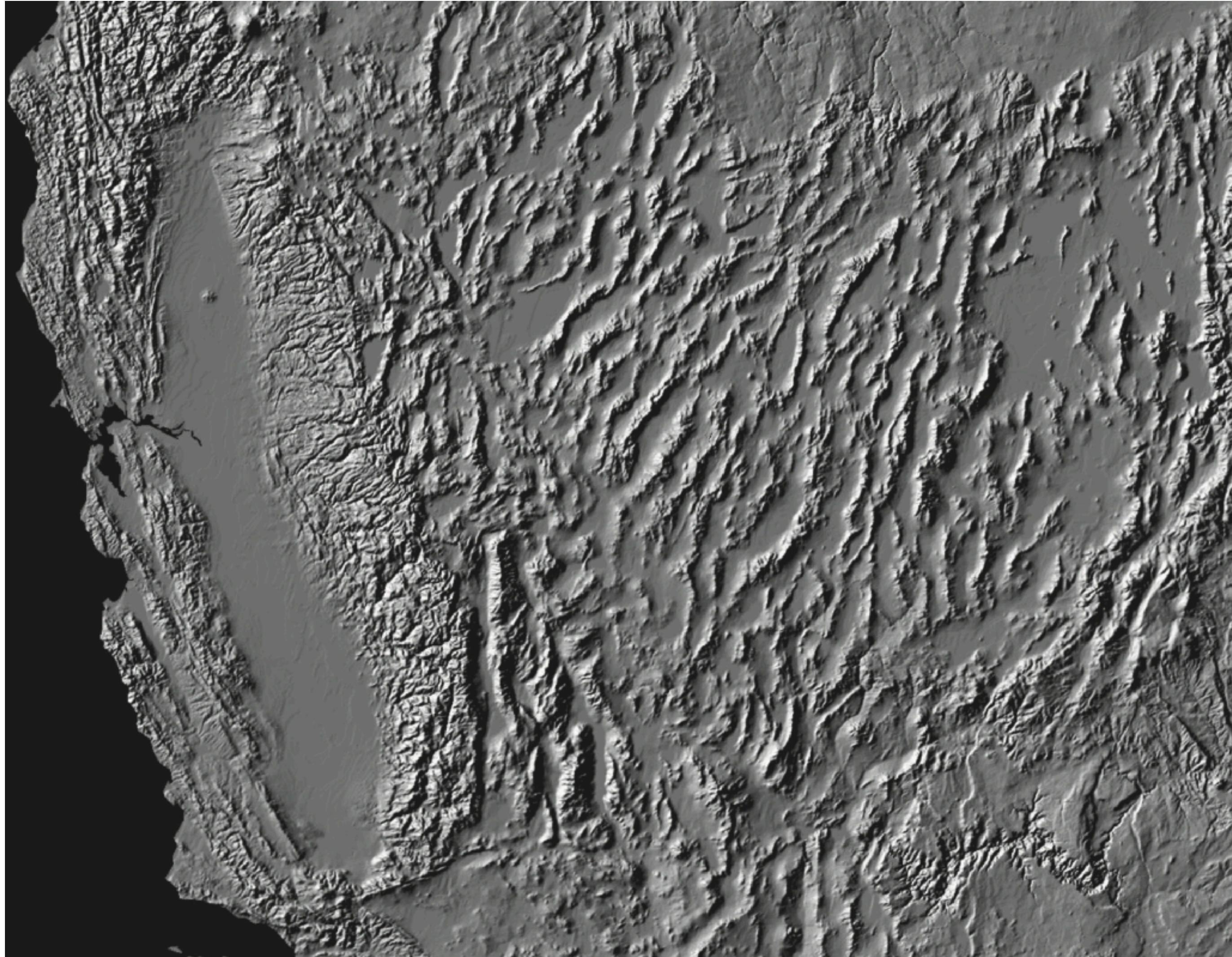
Satellietfoto's



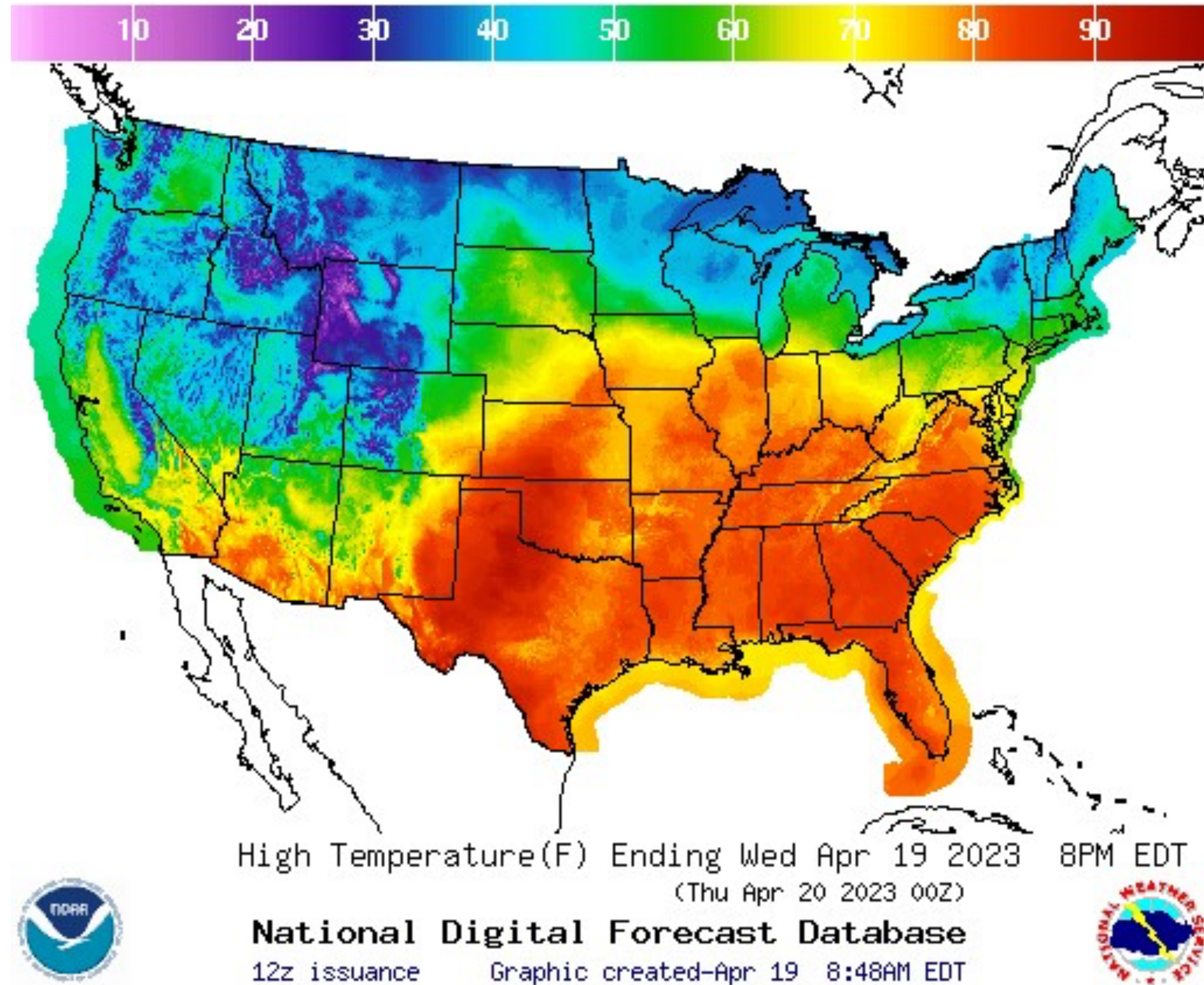
Satellietfoto's



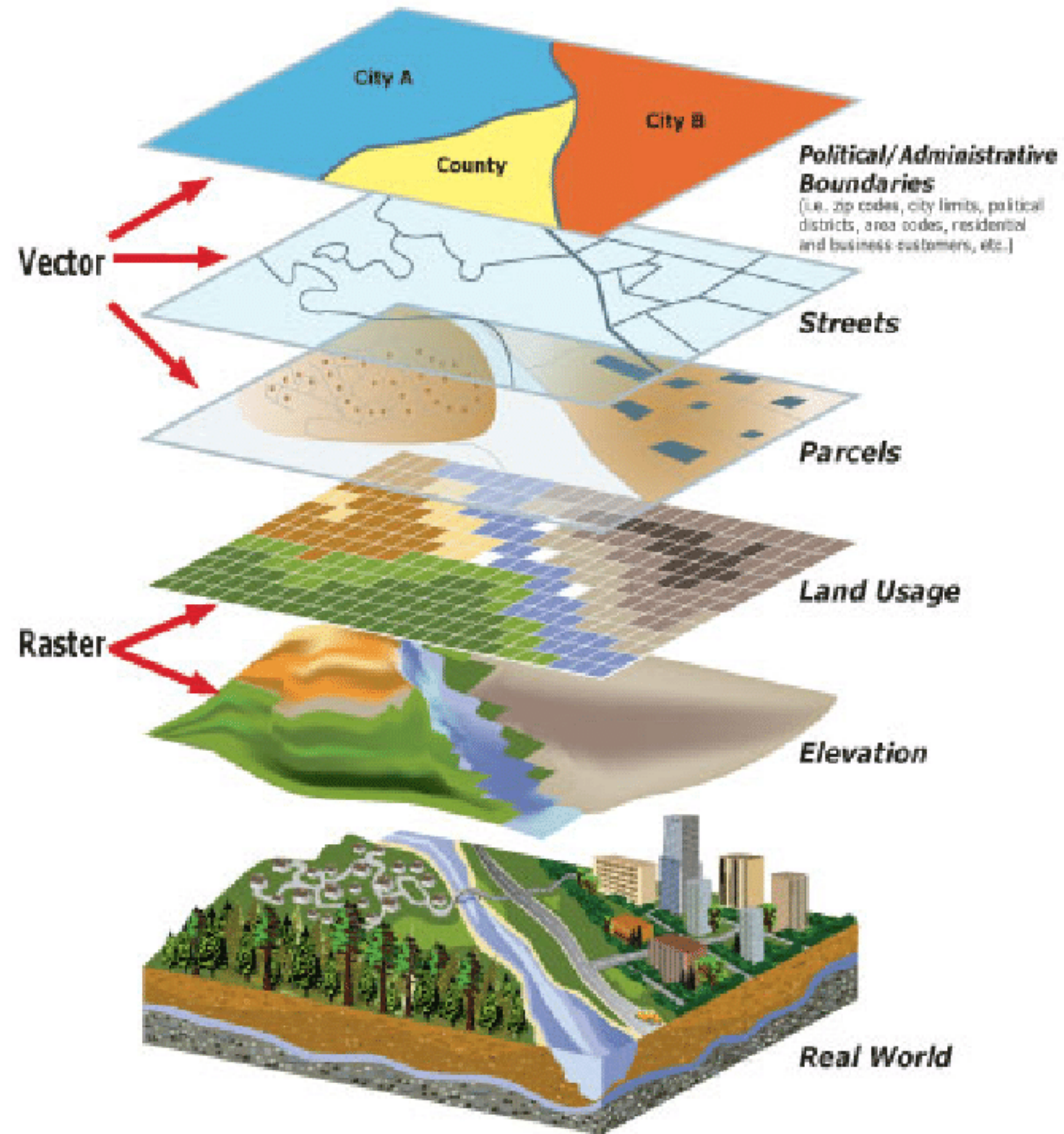
Hoogte



Temperatuur



Kaartlagen



EduGIS

A very short course on



Stijn Oomes

Friday 3 October 2025

Maptime Amsterdam at TomTom

EduGIS

1. start kaart.edugis.nl
2. choose (background) layers
3. draw your own layer
4. save & print your work
5. load your earlier work

Versions

- there are multiple versions
 - <https://kaart.edugis.nl/> ← **use this one**
 - <https://kaart.edugis.nl/v2/>
 - with > Upload table [understands .csv files, function not clear]
 - <https://kaart.edugis.nl/v2/mapbox.html>
 - with > Map projection

Save layers

- save *one* layer
 - > Selected Map Layers
 - icon below active layer:  “Save” as .json file
- save *all* layers
 - > Selected Map Layers
 - icon below all layers:  “Save layer set” as .zip file

GeoJSON file format

- filename extensions
 - .json
 - .geojson
- <https://en.wikipedia.org/wiki/GeoJSON>

GeoJSON file format

```
{
  "type": "FeatureCollection",
  "features": [{
    "type": "Feature",
    "geometry": {
      "type": "Point",
      "coordinates": [102.0, 0.5]
    },
    "properties": {
      "prop0": "value0"
    }
  }, {
    "type": "Feature",
    "geometry": {
      "type": "LineString",
      "coordinates": [
        [102.0, 0.0],
        [103.0, 1.0],
        [104.0, 0.0],
        [105.0, 1.0]
      ]
    }
  }
]
```




```

    "properties": {
      "prop0": "value0"
    },
    {
      "type": "Feature",
      "geometry": {
        "type": "LineString",
        "coordinates": [
          [102.0, 0.0],
          [103.0, 1.0],
          [104.0, 0.0],
          [105.0, 1.0]
        ]
      },
      "properties": {
        "prop0": "value0",
        "prop1": 0.0
      }
    },
    {
      "type": "Feature",
      "geometry": {
        "type": "Polygon",
        "coordinates": [
          [
            [100.0, 0.0],
            [101.0, 0.0],
            [101.0, 1.0],
            [100.0, 1.0],
            [100.0, 0.0]
          ]
        ]
      },
      "properties": {
        "prop0": "value0",
        "prop1": 0.0
      }
    }
  ]
}

```

↓ file format



Load layers

- open .json or .zip files
 - > Add map layers
 - icon top right:  “from file”

Some observations

- standard version has *many many many* layers built in
 - eg. maps from Blaeu !
- you can only save *layers*
 - individually as a .json file
 - all together as a .zip file
- you can not print from EduGIS
 - use screenshot
 - use > Print... from browser

Source

- Stichting EduGIS, YouTube kanaal
 - **Zelf kaartlagen maken met EduGIS**
 - <https://youtube.com/playlist?list=PLGaFD1xPQgsQY0dNRXKd-Dt1Fg0QF4O4M&si=JHjUvYald4DVA1uf>

Oefening

- gebruik historische kaarten in EduGIS om een dramatische verandering te illustreren
- kies je favoriete lokatie en historische periode
- voorbeelden
 - Dam, Amsterdam: Oude Stadhuis → Nieuwe Stadhuis
 - Haarlemmermeer → Haarlemmerpolder → Schiphol
- voeg jaartallen toe in **grote cijfers**

Amsterdam Geo-Walk

Inschrijven via Skool

<https://www.skool.com/amsterdam-geo-walk-2815>



Write something

Go Live

Geo-Walk for HvA students is happening in 8 days

All

General discussion



Stijn Oomes

8d • General discussion

Pinned

Welcome Geo-Walkers!

Welcome to the Amsterdam Geo-Walk! Check out the courses in the Classroom for all kinds of interesting facts about the people & places along the route. Details of the upcoming Geo-Walks can also

2 0

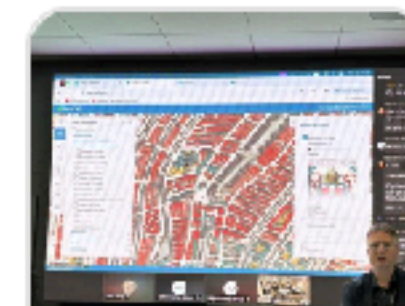


Stijn Oomes

4d • General discussion

EduGIS workshop at Maptime Amsterdam

We had another great Maptime meetup at TomTom last Friday. Thanks again to



Amsterdam Geo-Walk

skool.com/amsterdam-geo-walk-2815

Where geometry meets geography. Where the Dutch Golden Age meets the Scientific Revolution.

15

Members

0

Online

1

Admin

SETTINGS

Suggested communities

