

UNIVERSITY OF TWENTE.

# CARTOGRAPHY in a Web World

Nationale GI Minor

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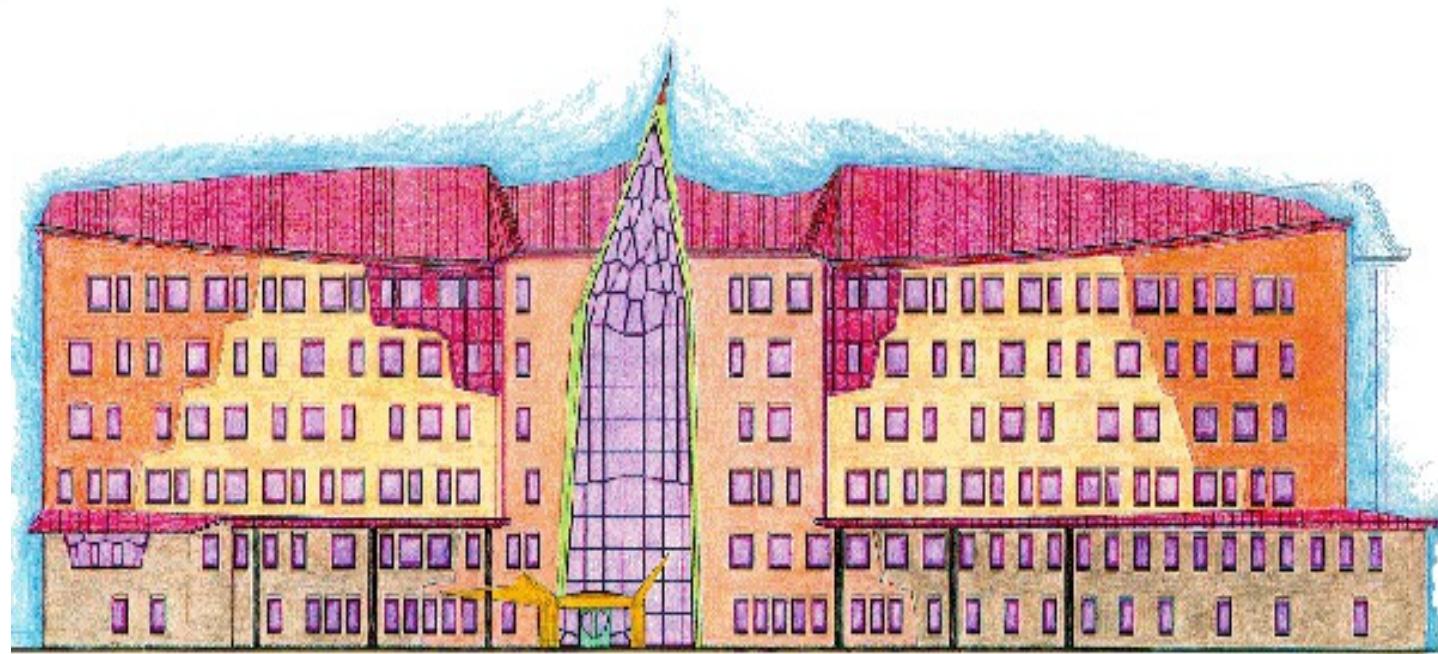
FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

# Agenda

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- Short introduction to ITC and me
- Cartography: communicating spatial data
- Changing GIS & Cartography
  - technology: new mapping possibilities
  - technology: 3 kinds of open:  
open standards, open source & open data
  - results in easy access to powerful tools & data
  - everyone's a mapmaker now...!
- Hands-on workshop:
  - Using selected Open Source tools and Open Data to visualize your spatial data

# **short introduction to ITC**



<http://www.itc.nl/>



**ITC** UNIVERSITY OF TWENTE.

# Faculty of Geo-Information Science and Earth Observation of the University of Twente



- located in Enschede (The Netherlands)
- yearly registration: > 400 students
- average duration of stay: 14 months
- average age: 34 years
- 1950-2010 > 14.000 students from > 160 countries
- scientific & supporting staff: ± 190 fte

# ITC's mission

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- the use of geographic information for sustainable development
- knowledge transfer: learning
- knowledge development: research and advisory services
- strengthen capabilities of individuals and organisations
  - in developing countries
  - mid career professionals

# Education at ITC: Target Group

- Young and mid-career professionals, and scientists from developing and emerging countries
- Increasingly professionals from industrialised countries

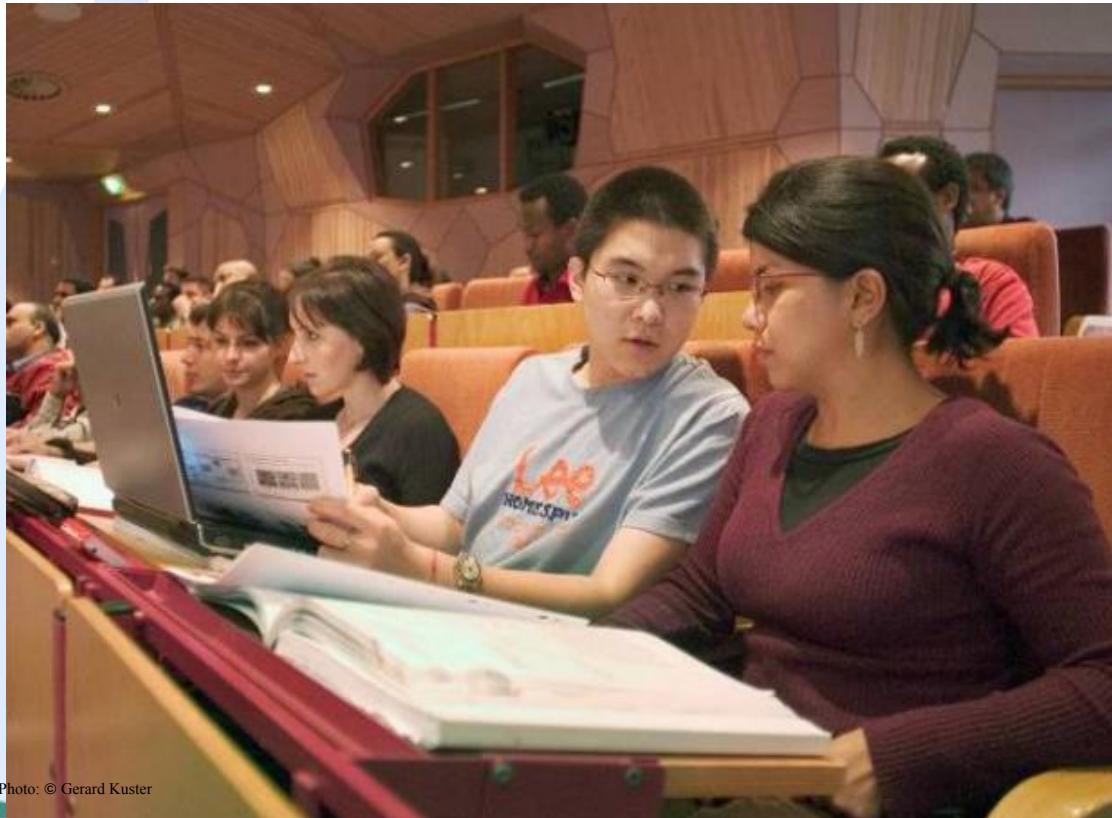


Photo: © Gerard Kuster



# Education at ITC: Programmes

## Graduate programme

- Doctorate (PhD) 3½ to 4 years

## Degree programme:

- Master of Science (MSc) 18 months
- Master (PM) 12 months

## Diploma programme:

- Postgraduate diploma (PGD) 9 months
- Diploma 9 months

*Language of instruction is English*

# Education at ITC

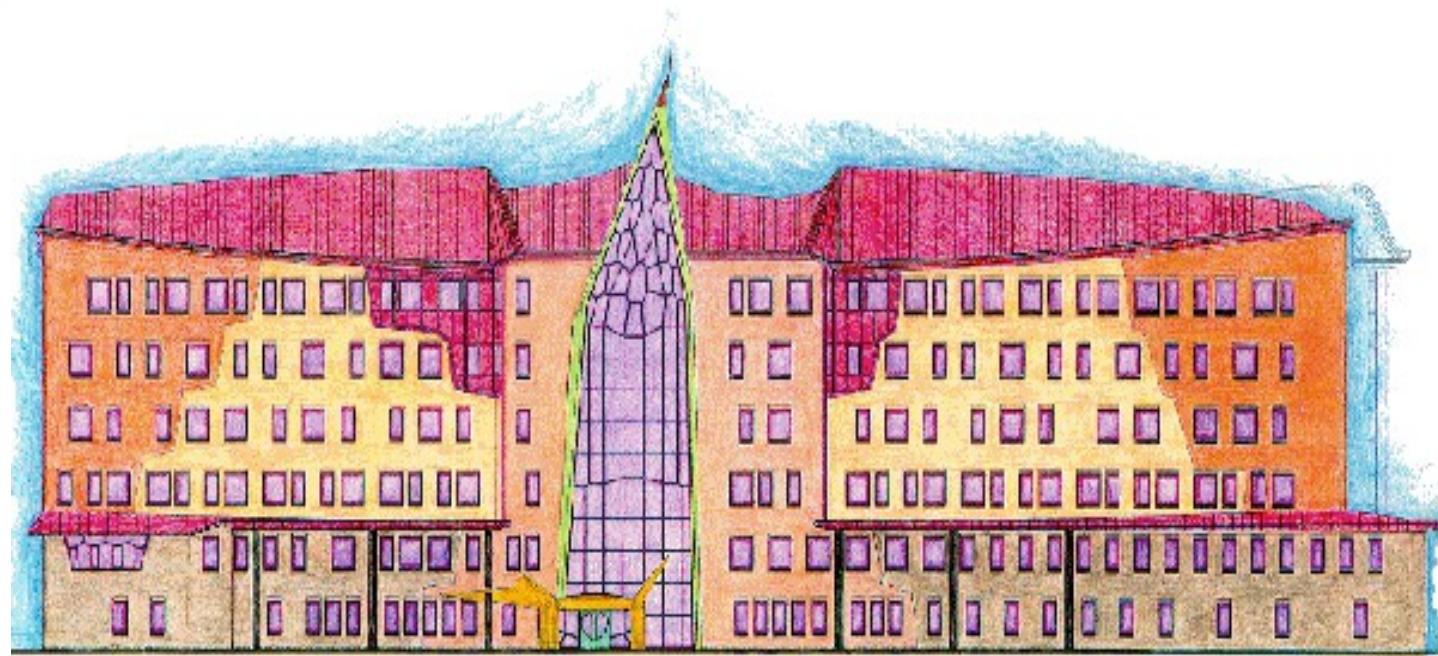
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8 courses:

- Geoinformatics (MSc, Master, PGD, diploma)
- Applied Earth Sciences (MSc, PGD)
- Environmental Modelling and Management (MSc)
- Governance and Spatial Information Management (MSc)
- Land Administration (MSc, PGD)
- Natural Resources Management (MSc, PGD)
- Urban Planning and Management (MSc, PGD)
- Water Resources and Environmental Management (MSc, PGD)



# Cartography: communicating spatial data



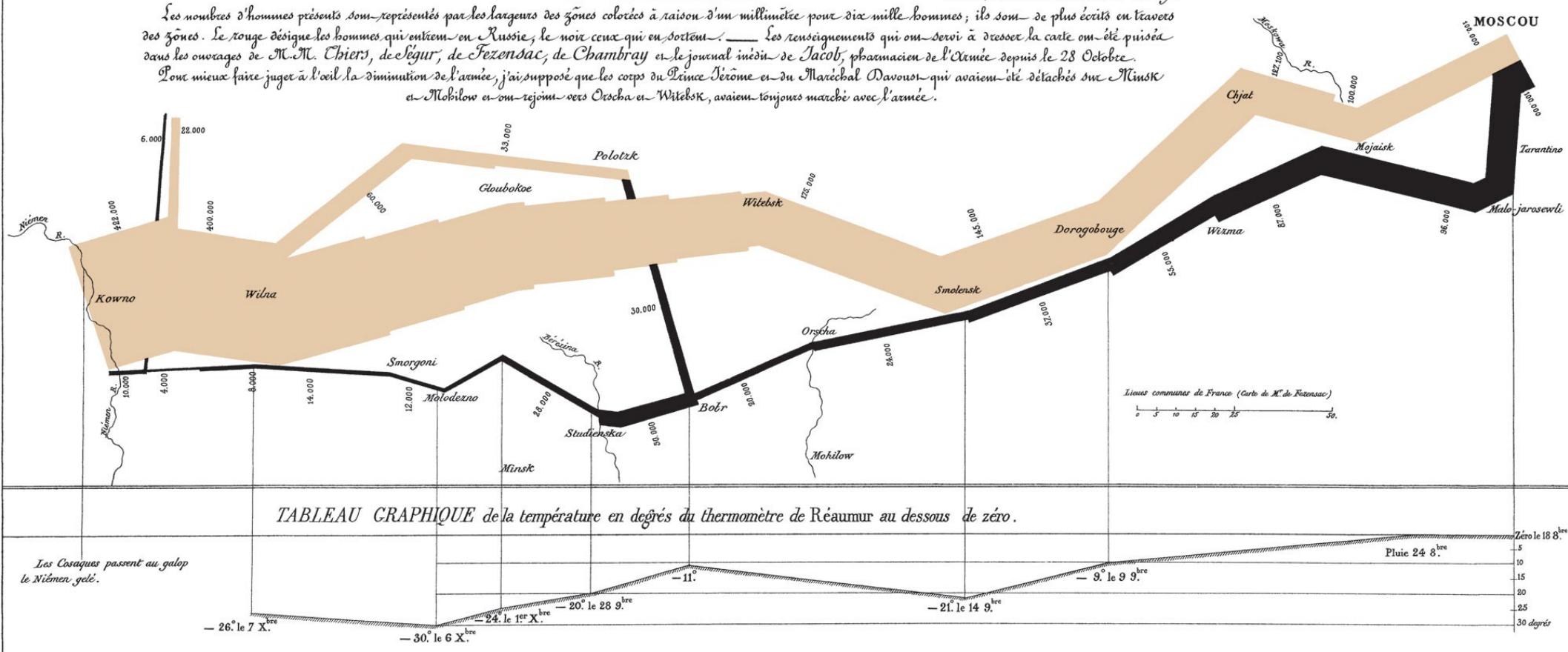
# Why use carto-graphics?

## Maps give a sense of Place and Time

*Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.  
Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite  
Paris, le 20 Novembre 1869.*

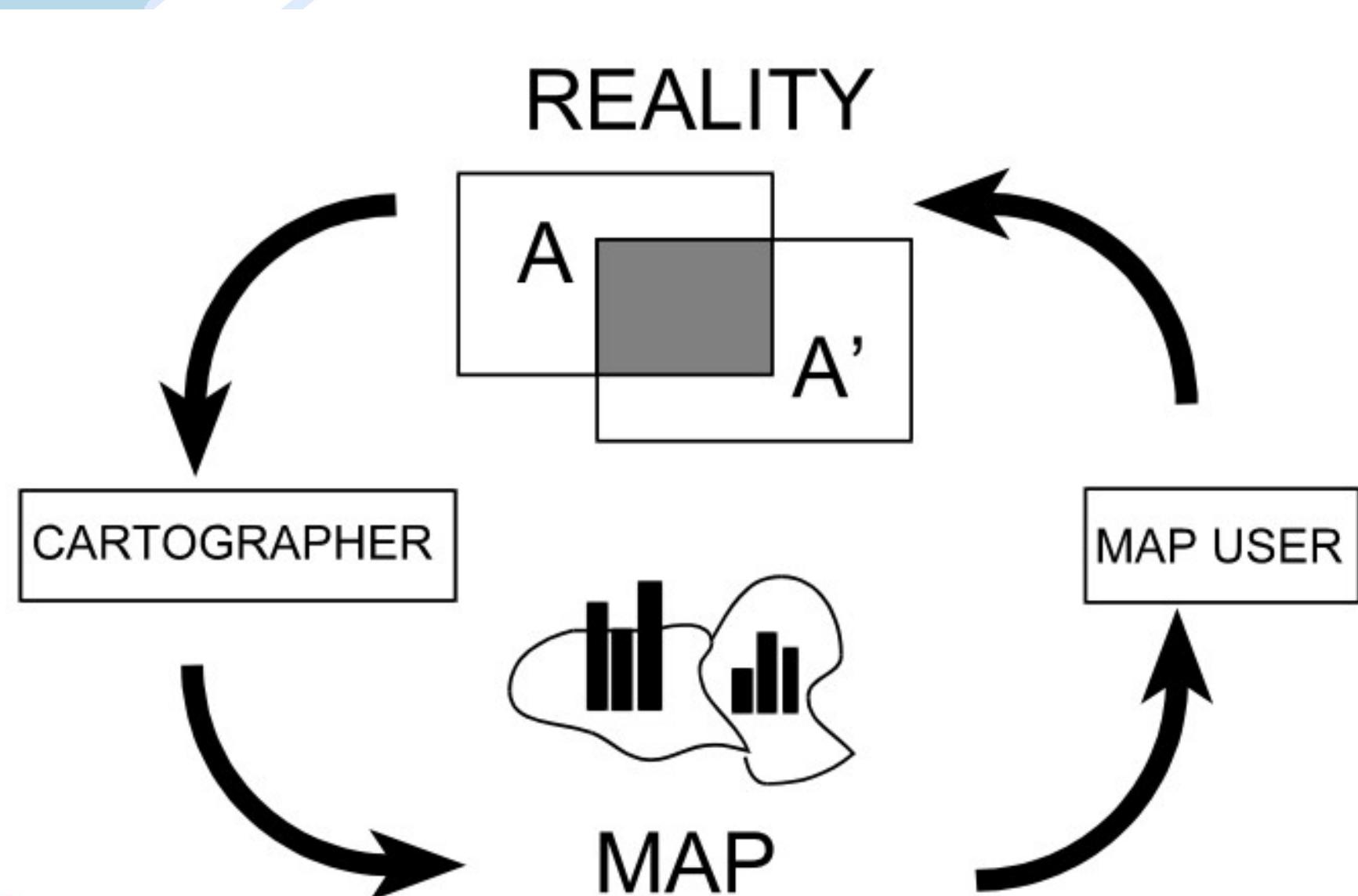
Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour six mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie; le noir ceux qui en sortent. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Segur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout, qui avaient été détachés sur Minsk et Mohilow et qui rejoignirent Orsha en Witebsk, avaient toujours marché avec l'armée.

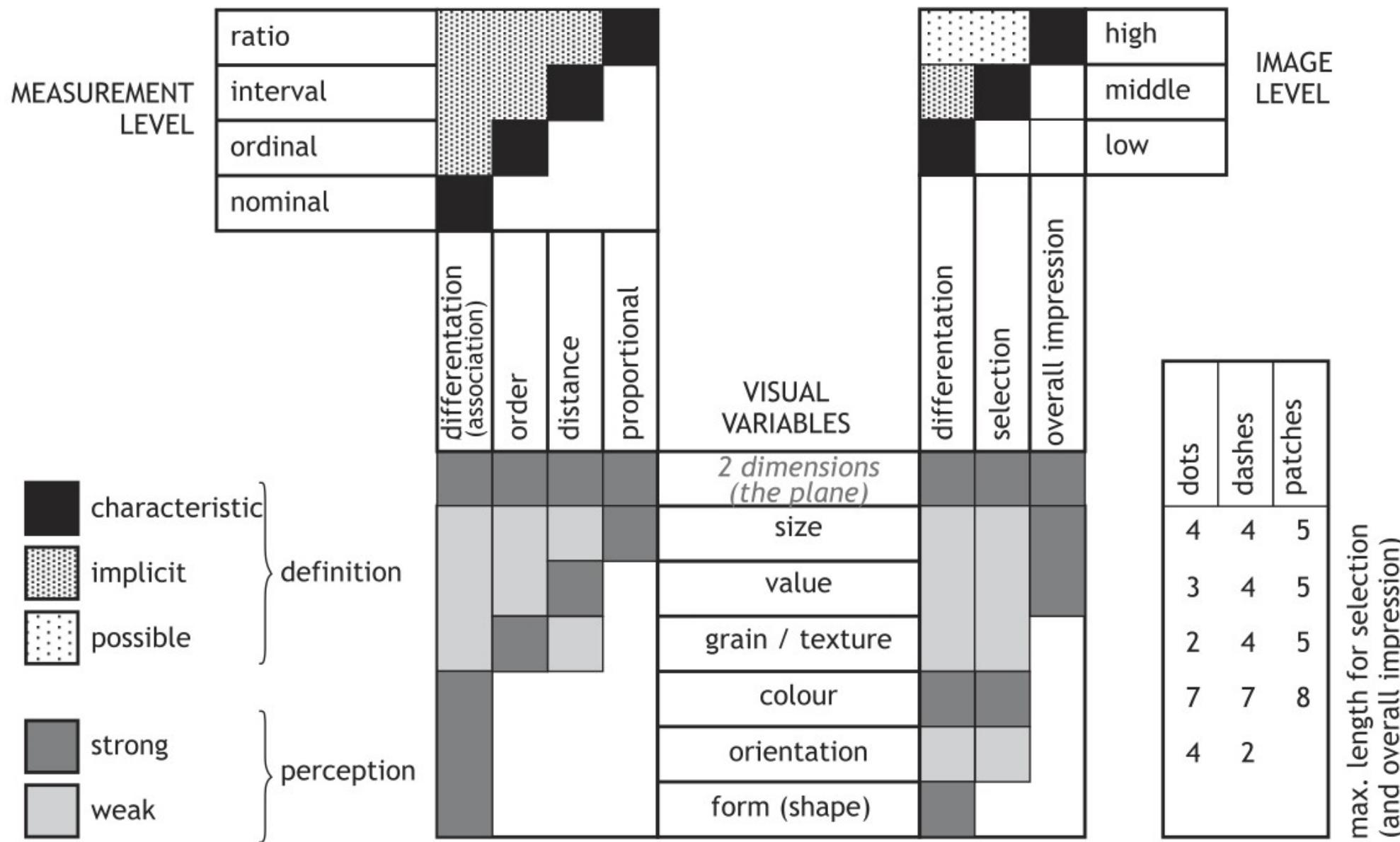


[http://en.wikipedia.org/wiki/Charles\\_Joseph\\_Minard](http://en.wikipedia.org/wiki/Charles_Joseph_Minard)

# THE CARTOGRAPHIC COMMUNICATION PROCESS



# Cartographic Grammar: rules for good maps



# Changing GIS & Mapping



Minority Report  
©2002 20th Century Fox

science fiction or reality?

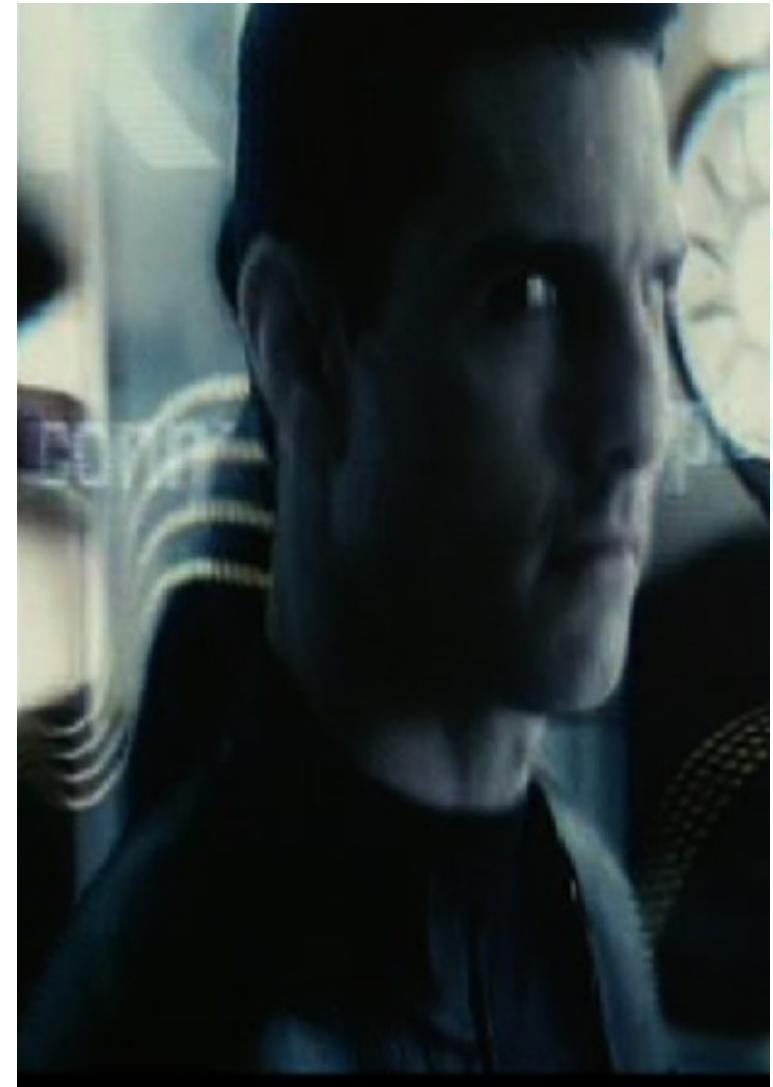


# **“...CUE TOM CRUISE...!”**

[‘Minority Report’ - Steven Spielberg, 2002]

Washington 2039:

John Anderton  
on the run for the  
‘pre-crime’ police...



# ALL ELEMENTS ALREADY EXIST...

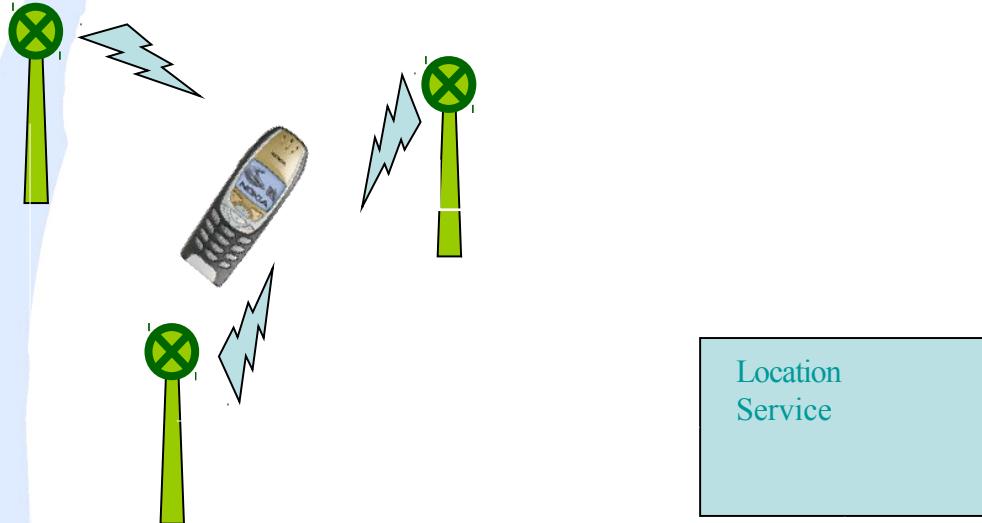
## I. Positioning – localising

Localising of person / device by the network

- biometry (iris-scanner / fingerprint)

- magnetic (smart-cards, smart-keys)

- radiometric (transponders / GSM cell-timing)



# ALL ELEMENTS ALREADY EXIST...

## I. Positioning – localising

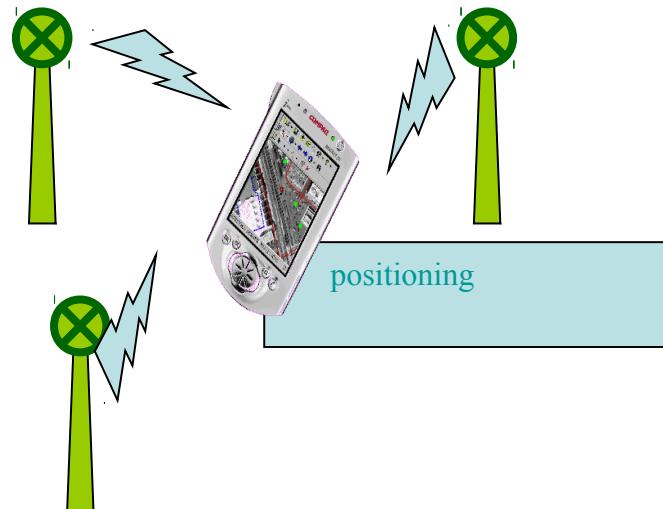
Positioning by device (using network)

feedback of network-positioning (eg. by SMS)

Global Positioning Systems

Inertial Navigation Systems

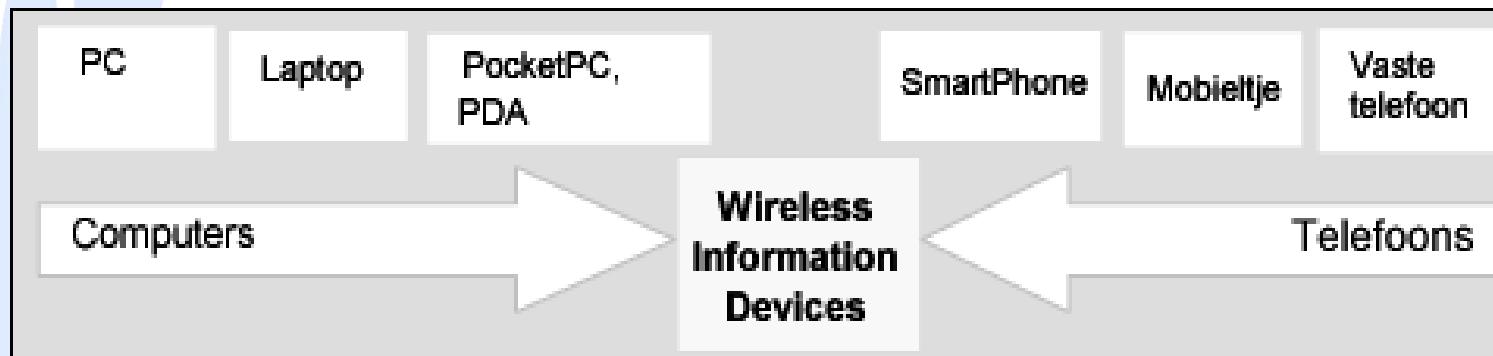
GSM / UMTS self-positioning



# ALL ELEMENTS ALREADY EXIST...

## 2. Mobile information devices (MIDs)

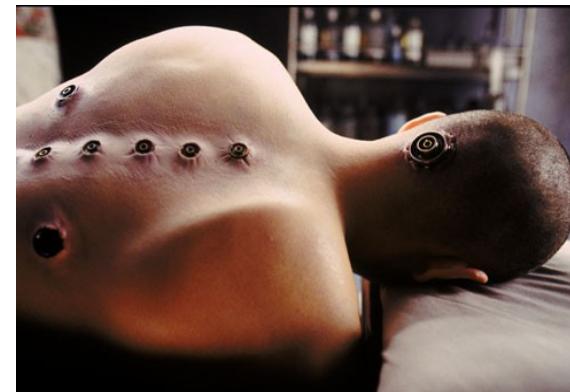
- graphic and alfanumerical display
- simple user interface
- portable



# ALL ELEMENTS ALREADY EXIST...

## 3. wireless connections between the parts

- between MIDs and network (WIDs or using phone)
- between MIDs themselves (IR, bluetooth)
- between MID and user (speech, 3D-gloves)



# ALL ELEMENTS ALREADY EXIST...

4. Location aware GIS => Location Based Services  
match services to combination of person+position

any GIS is 'location aware', but you also need:

distributed data + applications

locations of objects and persons, but also:

**locations of services**

temporal awareness



# ALL ELEMENTS ALREADY EXIST...

## 5. Location based services

- match services to combination of person+position

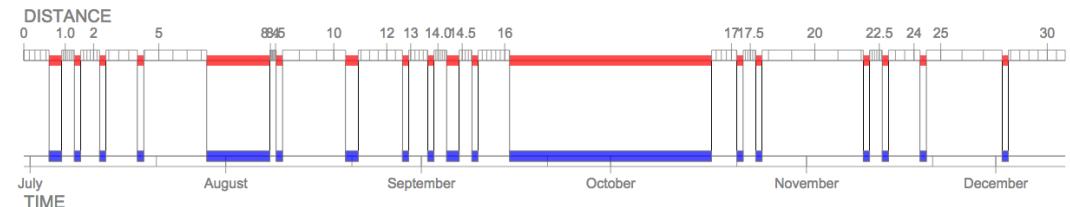


# Changing Cartography

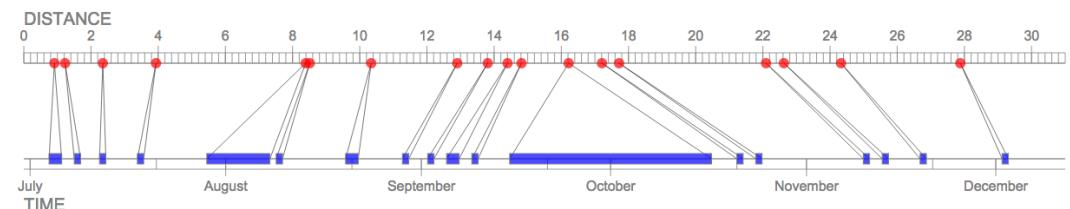
## GEOGRAPHY



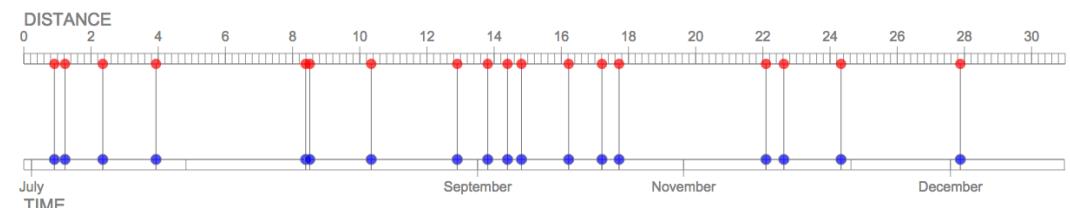
## FROM TIME TO GEOGRAPHY



## COMMON REPRESENTATION (both scales fixed)

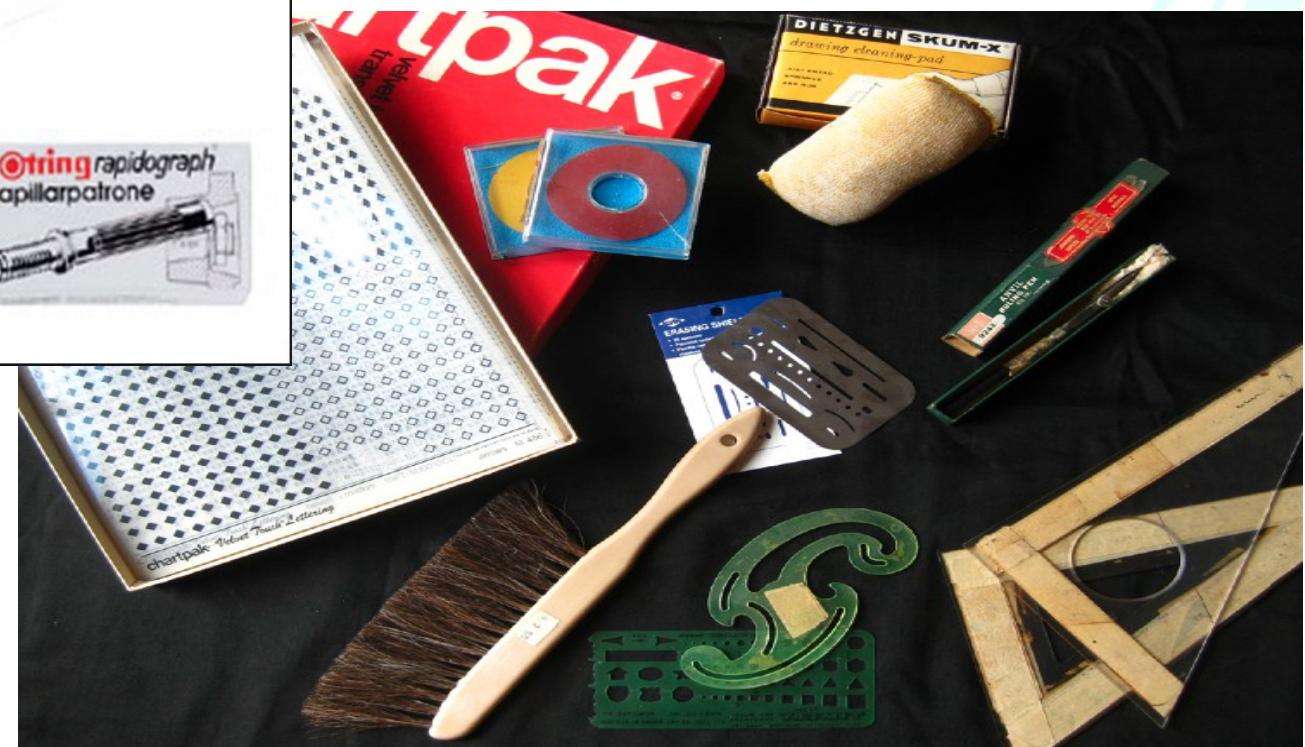


## FROM GEOGRAPHY TO TIME



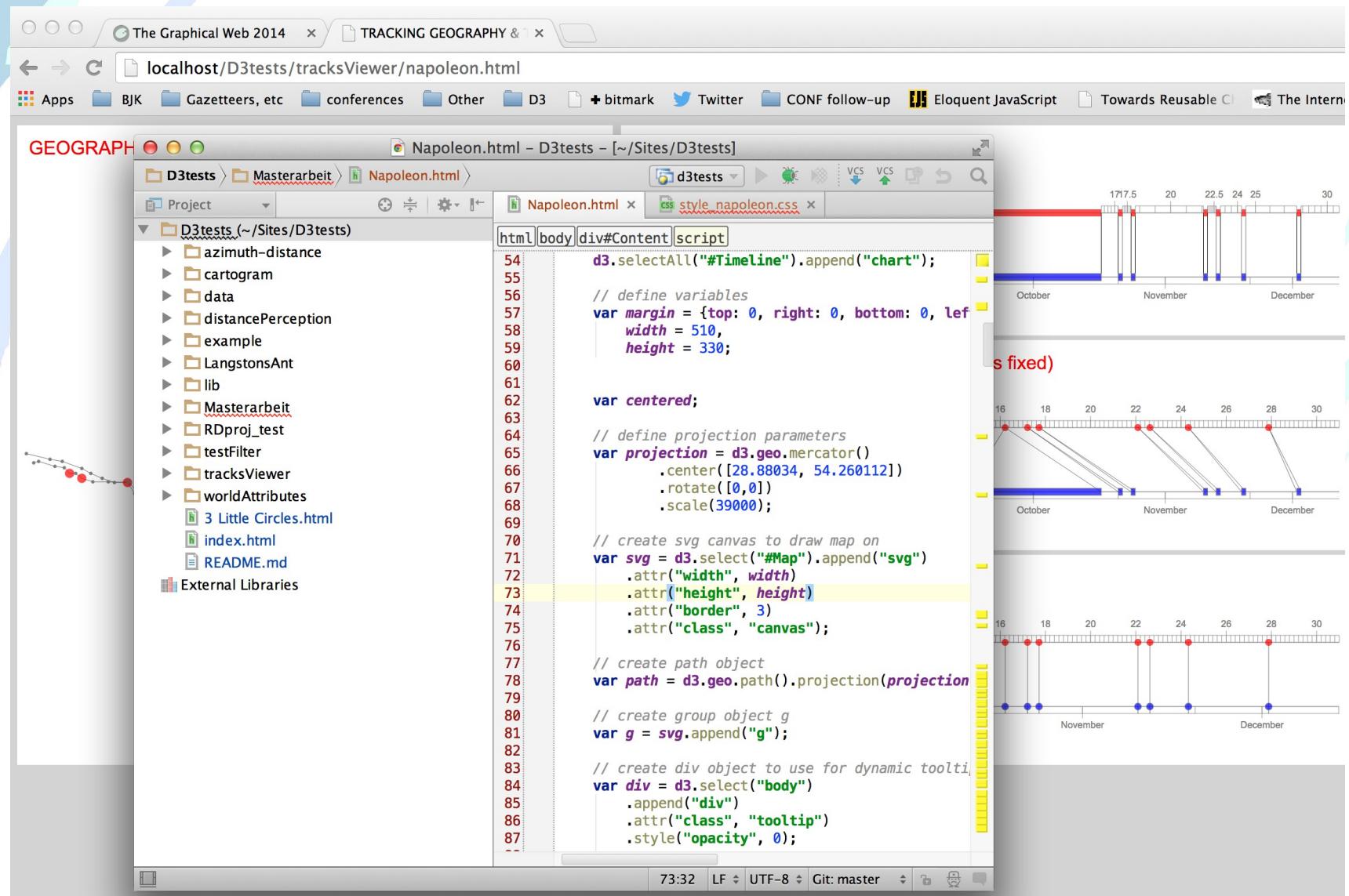
# A change in my world

My tools once were these:



# A change in my world

...but now look like this:



The screenshot shows a code editor interface with a file named `Napoleon.html` open. The code is written in JavaScript using the D3.js library to create a timeline visualization. The visualization consists of three horizontal timelines representing different paths or tracks. Each timeline has a blue bar at the top indicating a period from October 17 to December 30. Below the bars, dates are marked with red dots. The code uses the `d3.geo.mercator()` projection to draw a map canvas and a path object to represent the movement. A CSS file named `style_napoleon.css` is also visible in the editor.

```
54: d3.selectAll("#Timeline").append("chart");
55:
56:
57: var margin = {top: 0, right: 0, bottom: 0, left: 510,
58:   width = 510,
59:   height = 330;
60:
61:
62: var centered;
63:
64: var projection = d3.geo.mercator()
65:   .center([28.88034, 54.260112])
66:   .rotate([0,0])
67:   .scale(39000);
68:
69:
70: var svg = d3.select("#Map").append("svg")
71:   .attr("width", width)
72:   .attr("height", height)
73:   .attr("border", 3)
74:   .attr("class", "canvas");
75:
76:
77: var path = d3.geo.path().projection(projection);
78:
79:
80: var g = svg.append("g");
81:
82:
83: var div = d3.select("body")
84:   .append("div")
85:   .attr("class", "tooltip")
86:   .style("opacity", 0);
```

# Changing Cartography

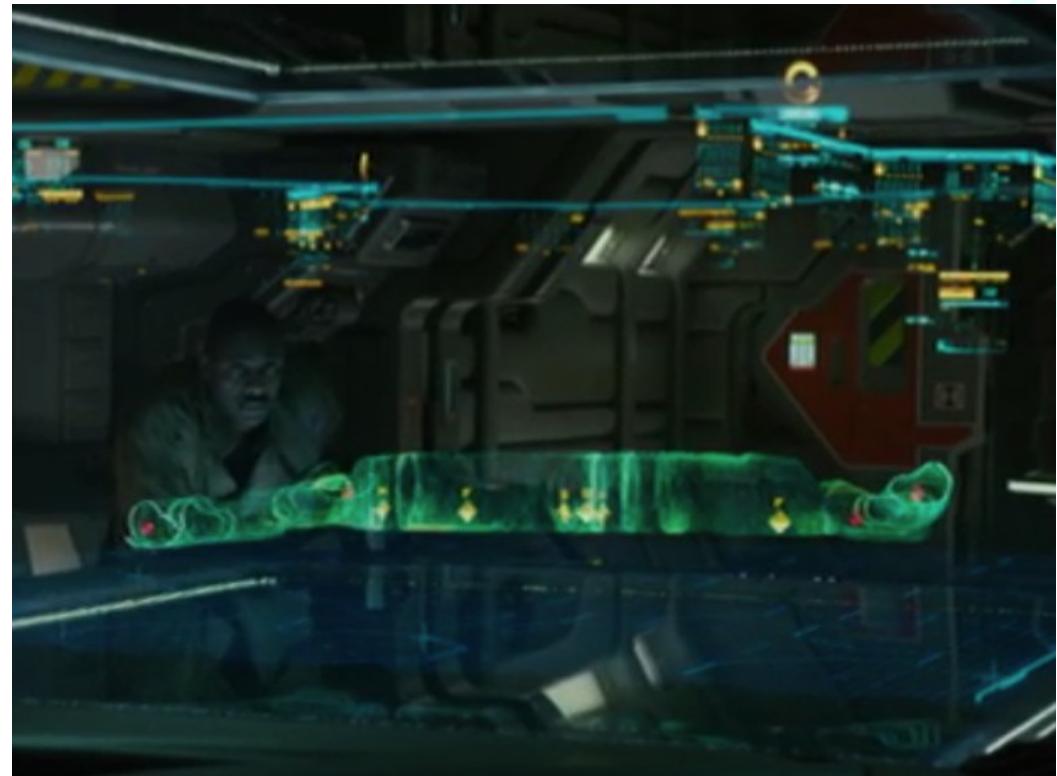
- new, more and easier data
- new types of maps
- new digital dissemination



# CHANGING CARTOGRAPHY

→ new, more and easier data

- localising and (self)locating
- “big data”
- open data



Prometheus  
©2013 20th Century Fox



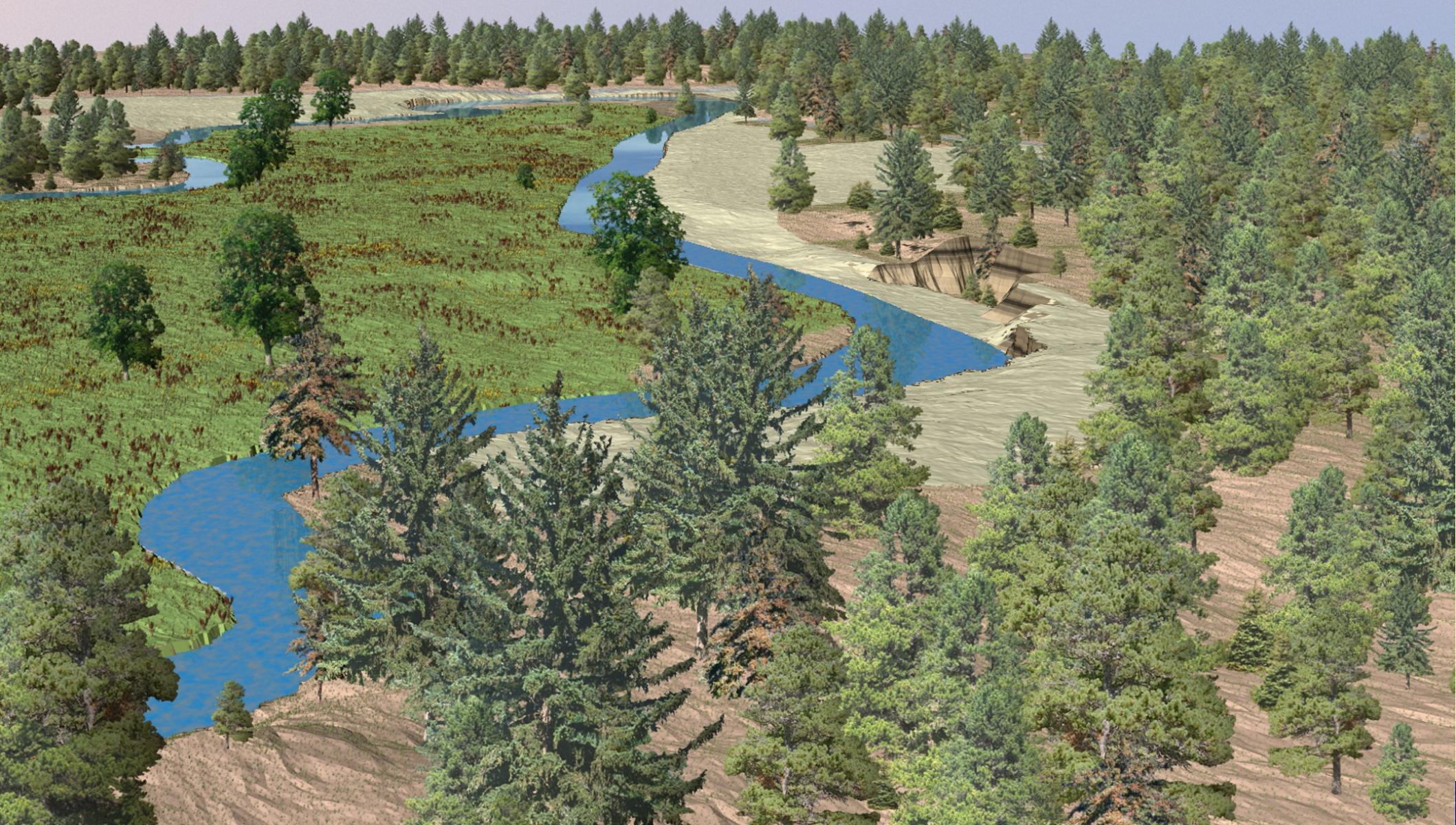
# CHANGING CARTOGRAPHY

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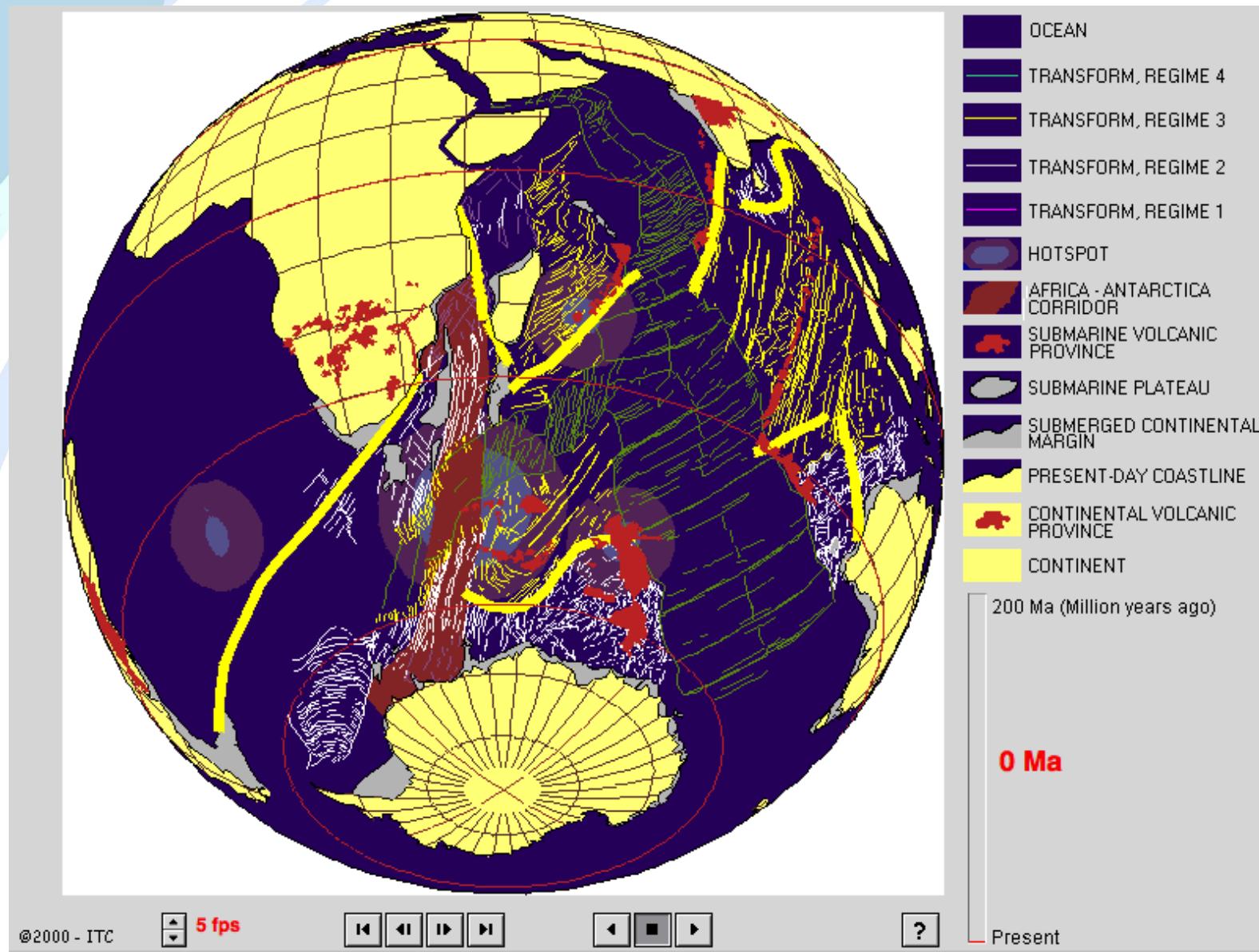
## → new types of maps

- Combining maps with other graphics, sound and moving images: **Multimedia**
- **Interactive**maps
- Realism & false realism: **Virtual worlds**
- Depiction of movement & change:  
**Animated maps**

# Virtual Worlds



# Animated maps



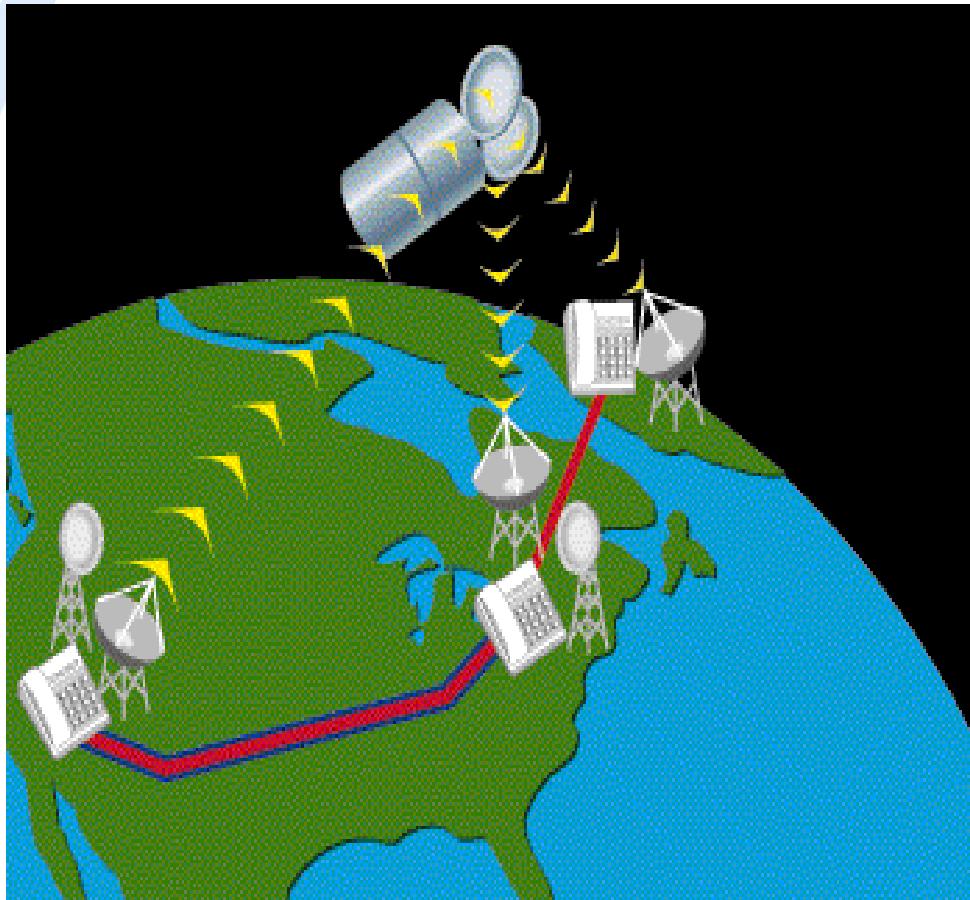
<http://kartoweb.itc.nl/gondwana/>

# CHANGING CARTOGRAPHY

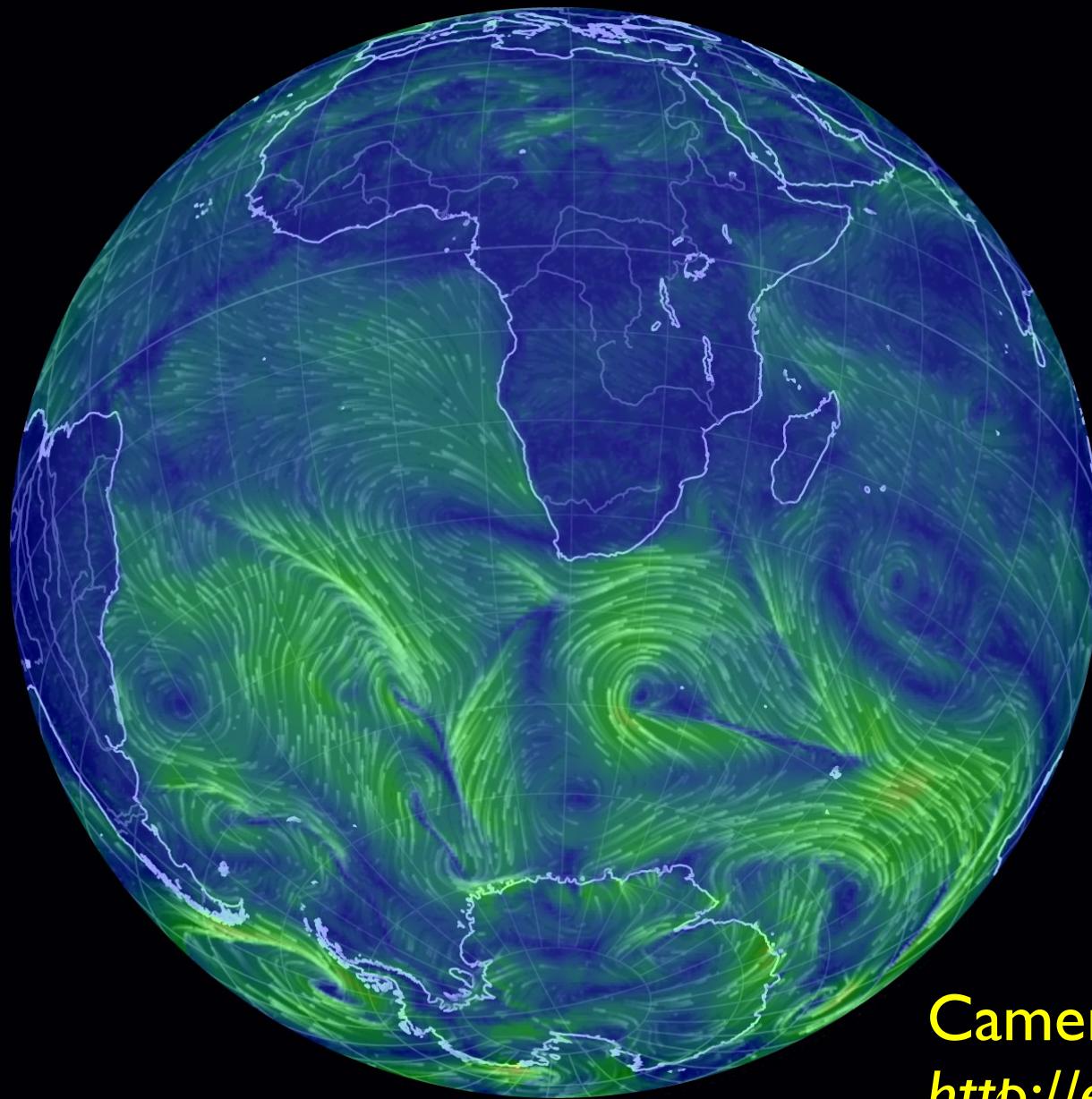
→ new (digital) data dissemination

On CD-ROM, DVD, etcetera

On the World Wide Web



# Web as a mapping platform



Cameron Beccario  
<http://earth.nullschool.net/>

# Web as a mapping platform

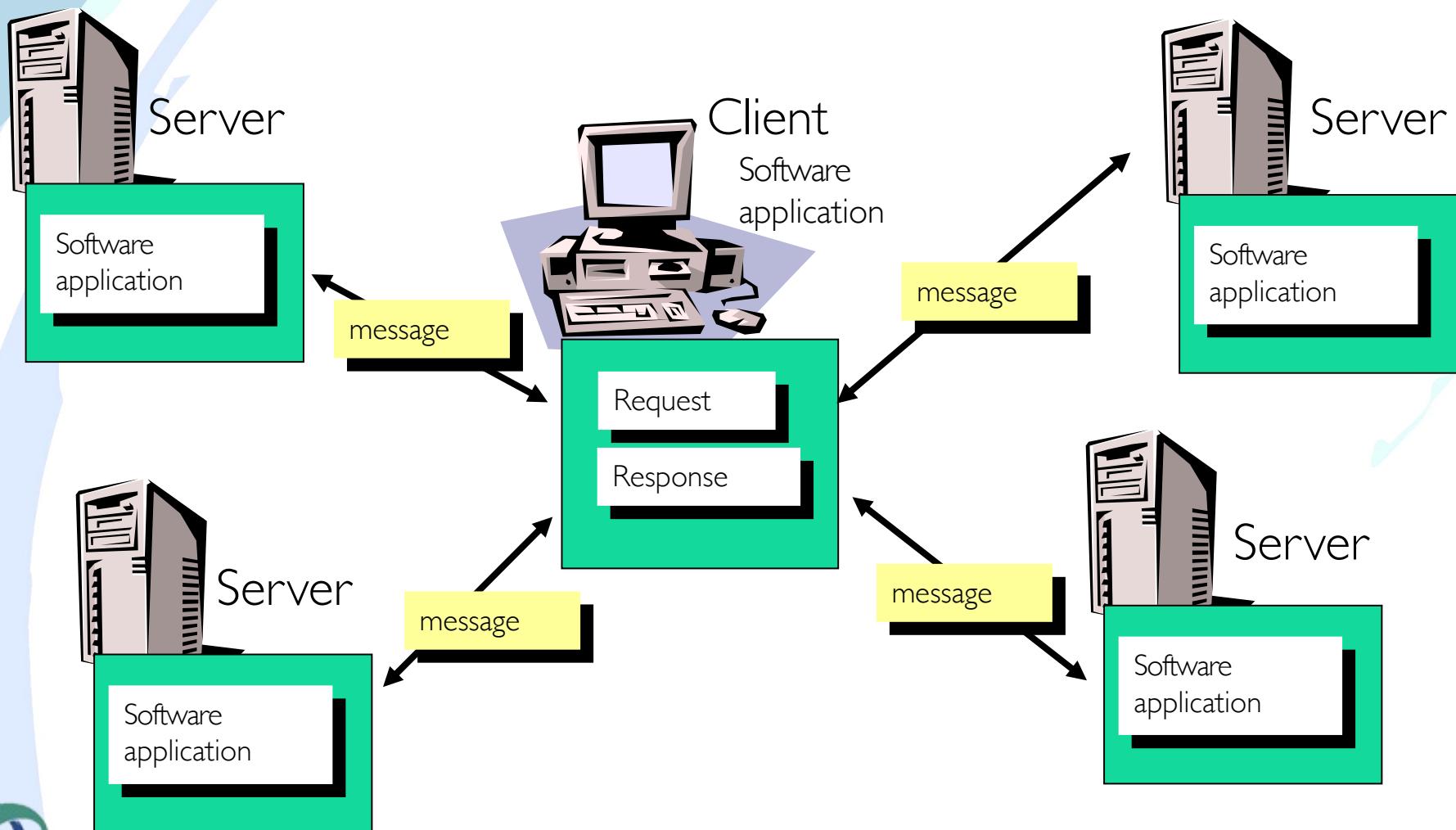
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combines what we discussed before:

- new data sources
  - Spatial Data Infrastructures, Portals, Sensor Networks
  - user = producer: Prosumers, Crowd-sourcing
- new map types
- new dissemination methods

# Open Standards for Interoperability

To communicate between systems we need to standardise the messages between them



# GeoWebServices

If webservices have *spatial* functionality, for example if they use geographic data, can output maps or find routes, we call them **geoweb**services

- Google Maps, Bing maps, etc.: interfaces are publicly available, but defined, developed and owned by commercial companies
- Open Standard GeoWebServices: Open Web Services (OWS) of the Open Geospatial Consortium (OGC).

# Open SOURCE software

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Source code is freely accessible

- free for all to use, change and (re)distribute
- usually allowed to sell products that include source code

Development done in public:

- usually not by a company
- by a *community*: distributed, informal team of developers

# Open source software STACK

(web)map-viewers, Graphic User Interfaces,  
desktop GIS, etcetera

- thin clients
- thick clients

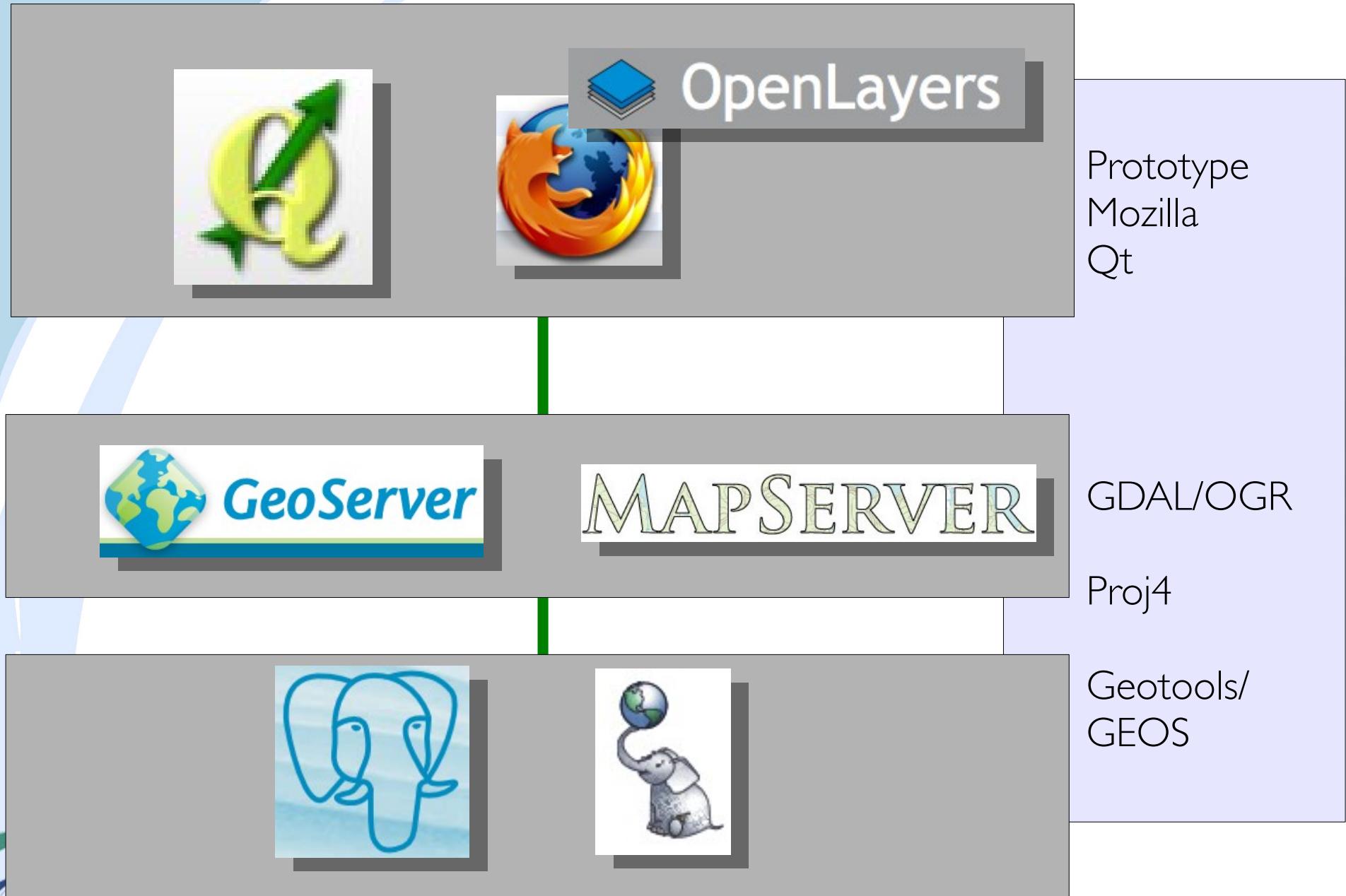
middleware: geo-webservices  
data-, map- and process services

Back-end: spatial databases

## **LIBRARIES:**

software components for:  
• data access  
• conversion  
• analysis  
• projection  
• graphics  
• etc...

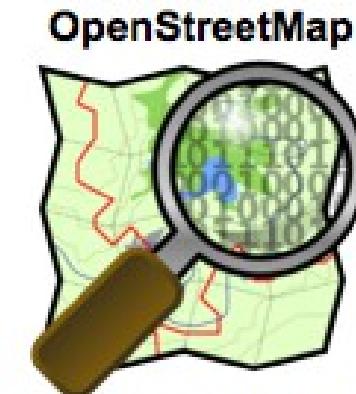
# The OSGEO stack at ITC



# Open Data

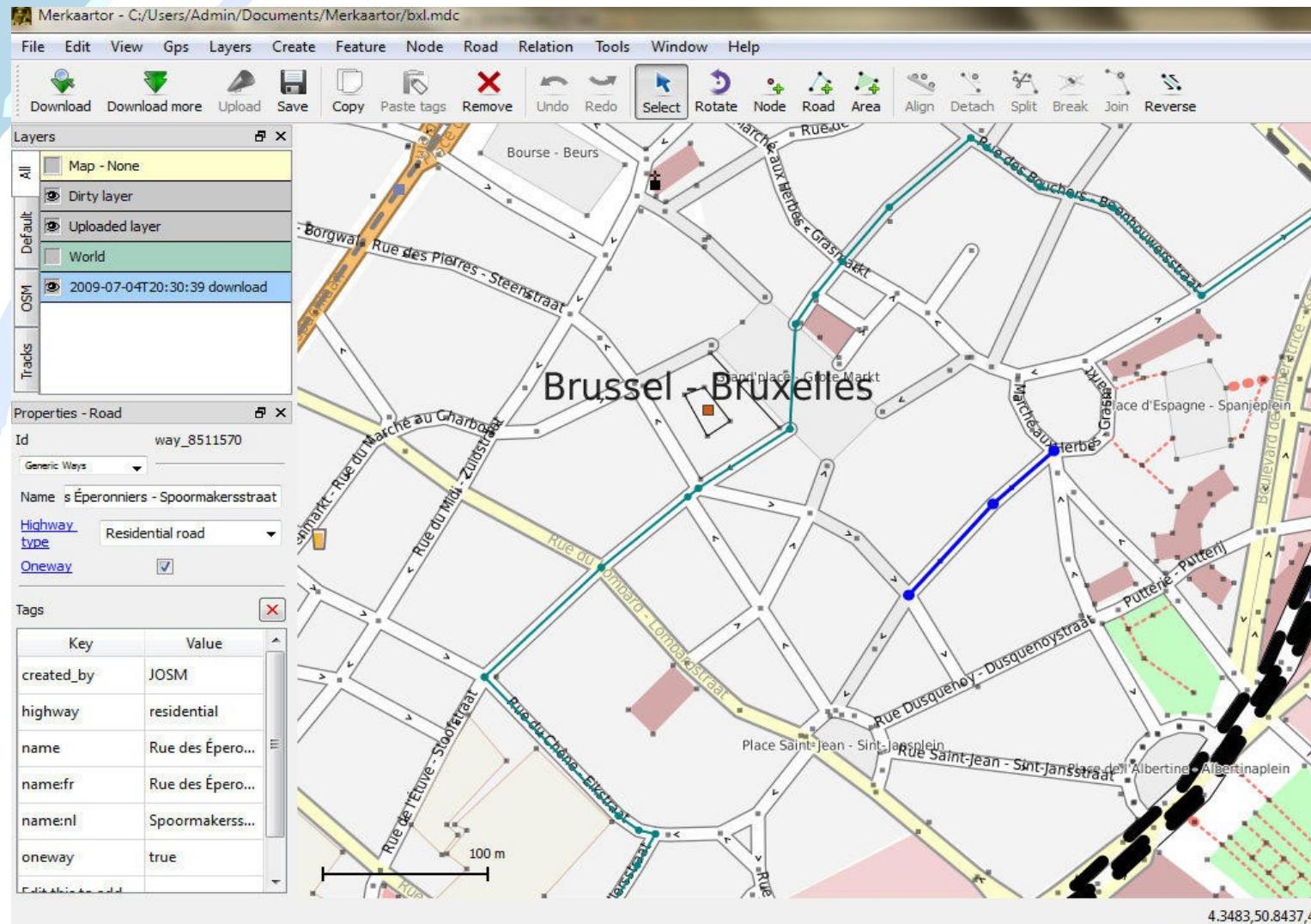
Open Data is maybe even more important than Open Source

- ***without data, software means nothing***
- much of the data is still proprietary
- some movement to public access of geo-data
  - ▶ EU INSPIRE initiative
  - ▶ USA federal data
  - ▶ **OpenStreetMap**



# Result: Easy access to lots of data & maps

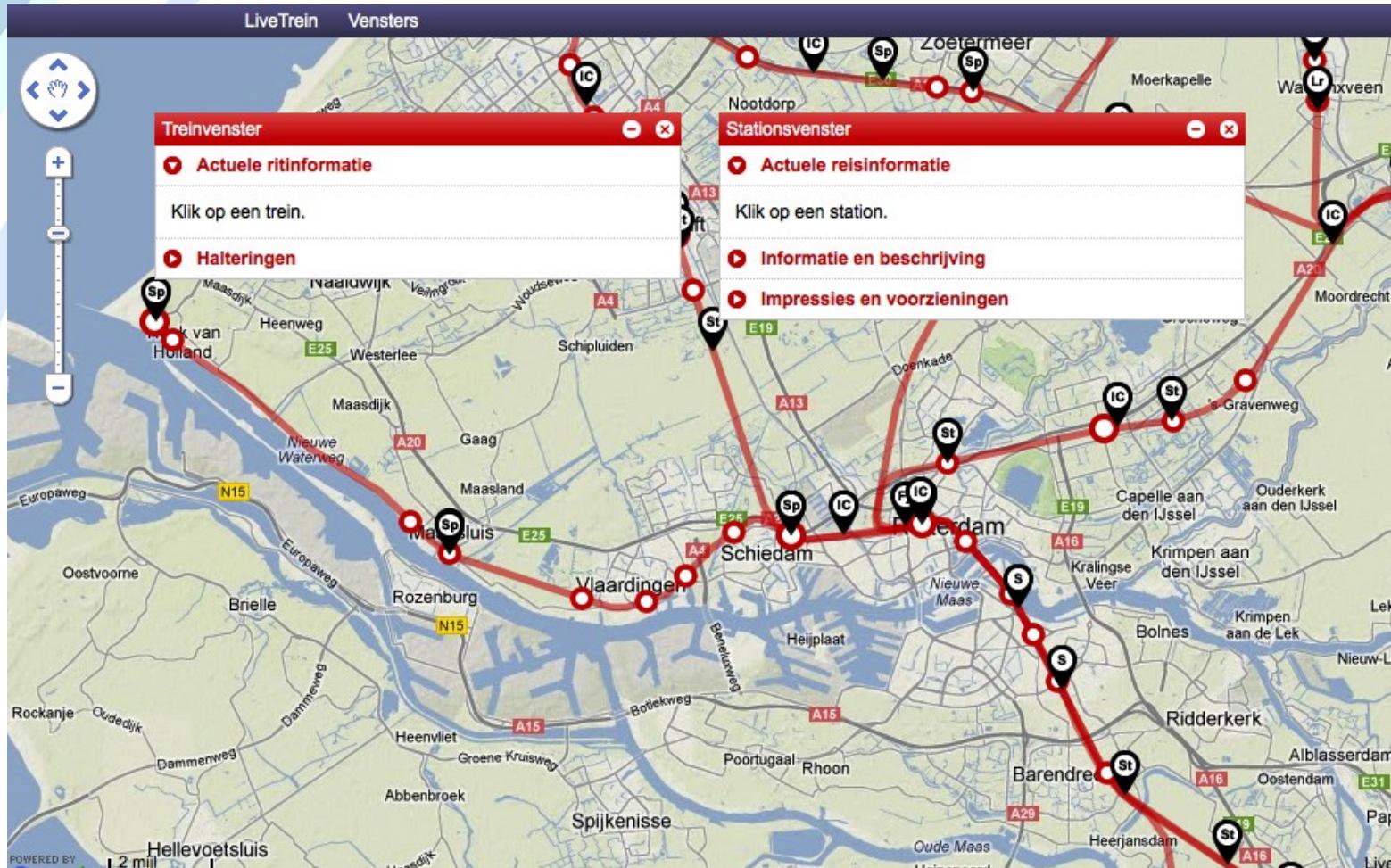
→ Crowd sourced and open data through open API's



<http://openstreetmap.org/>

# Result: Easy access to powerful tools & data

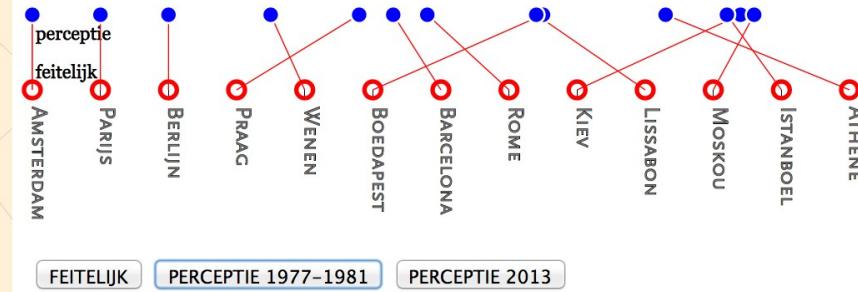
→ mashing up open data and animated maps



<http://www.flyabb.com/livetrein/fullscreen.php>

# Result: Easy access to powerful tools & data

→ “Coding Cartography”



Gepercipieerde afstanden in Europa in 1977-1981 en 2013

Studenten situeren Oost-Europese steden te ver weg en Zuid-Europese te dichtbij.

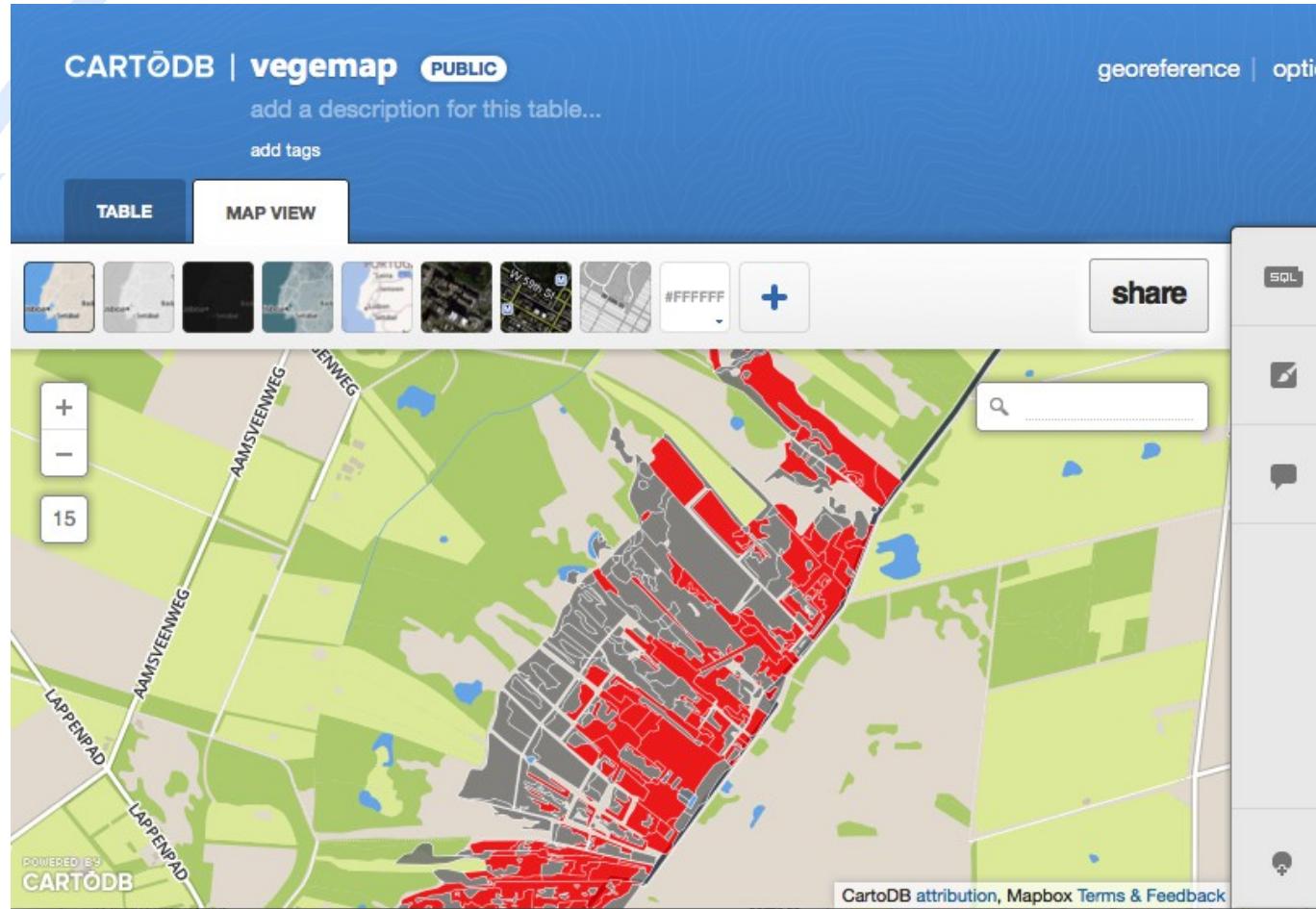
Klik op de knoppen om de verschillen te zien tussen de feitelijke locatie en volgorde, en zoals ze door studenten werden ingeschat in twee onderzoeksperiodes...

Werkt in moderne browsers die HTML5 ondersteunen (dus niet in Internet Explorer 8 en lager!)  
[kaart bij artikel: Oost-Europa blijft ver weg, de Pater et al, Geografie, 2014-03, pp.12-15]

[kartoweb.itc.nl/kobben/D3tests/distancePerception.html](http://kartoweb.itc.nl/kobben/D3tests/distancePerception.html)

# Result: Easy access to powerful tools & data

→ everyone's a mapmaker now...!



<http://cartodb.com>

# HANDS-ON WORKSHOP

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- Using selected Open Source tools and Open Data to visualize your spatial data
  - ▶ OpenStreetMap data and maps in a browser
  - ▶ The CartoDB interactive webmapping site
  - ▶ Creating your own mapping webpage
  - ▶ Creating your own KML data
  - ▶ Combine the KML with the OpenStreetMap
- materials to be found at:  
<http://kartoweb.itc.nl/kobben/visualisation-hands-on/>