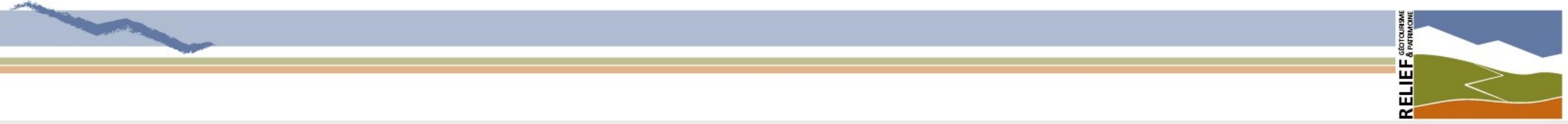
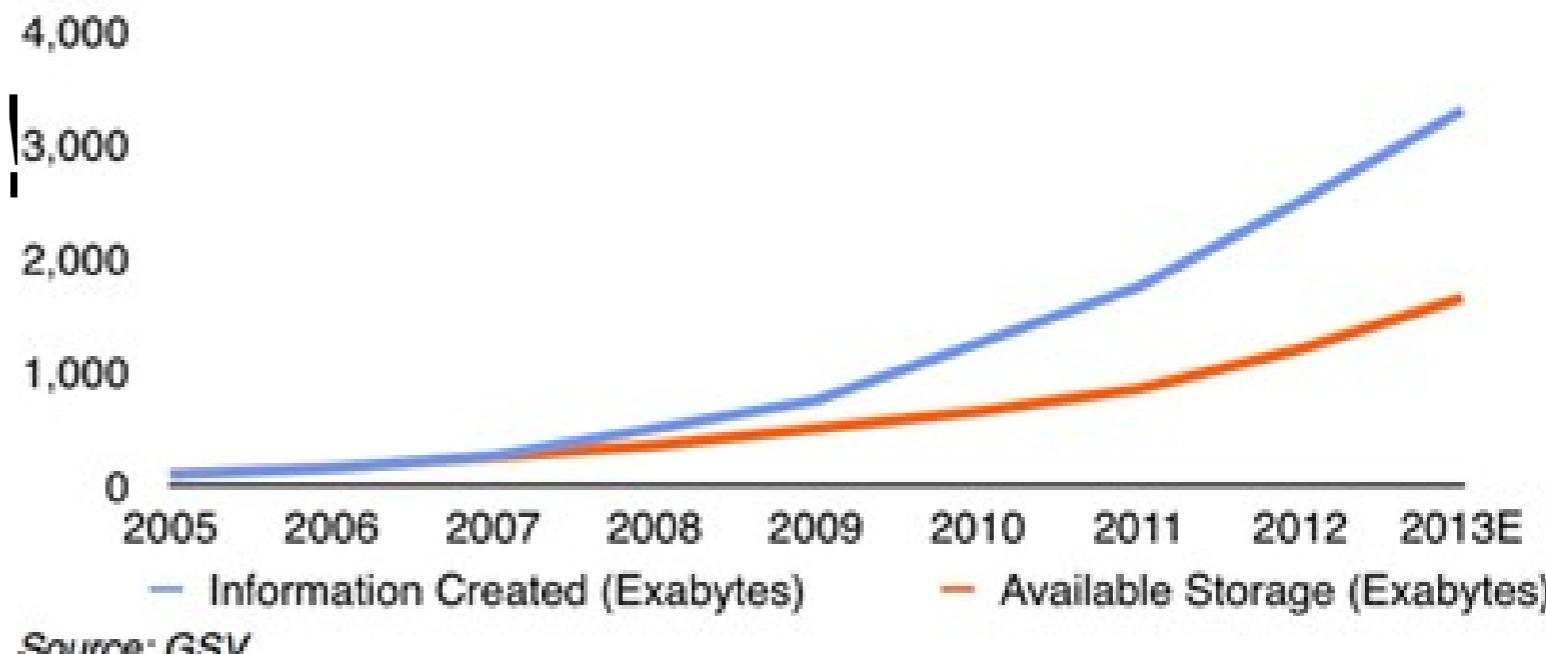
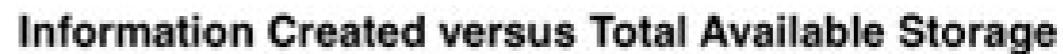


Visualization

Forms. Functions. Uses.



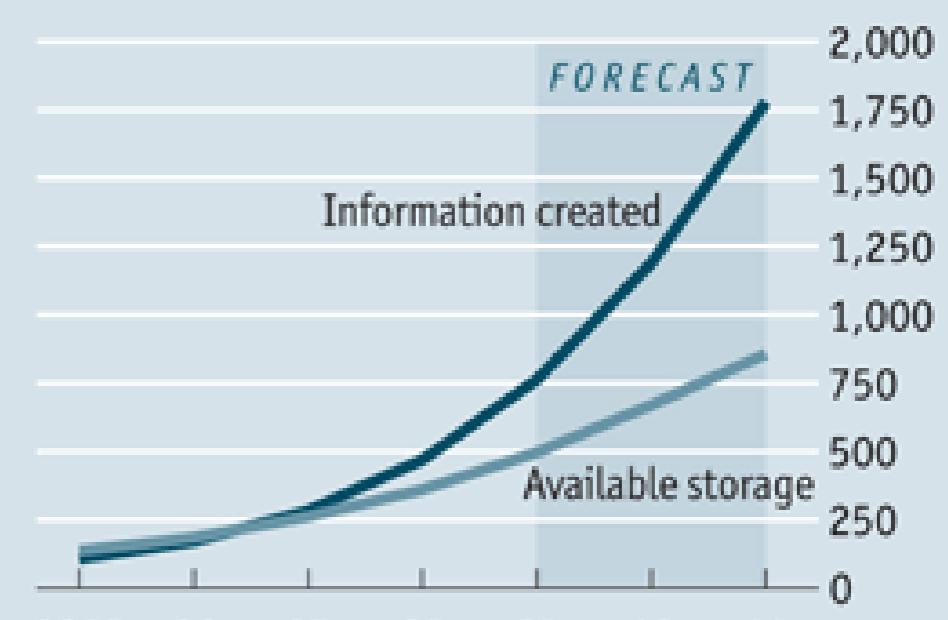
Data tsunami



Source: GSV

Overload

Global information created and available storage Exabytes



Source: IDC



Data, data everywhere

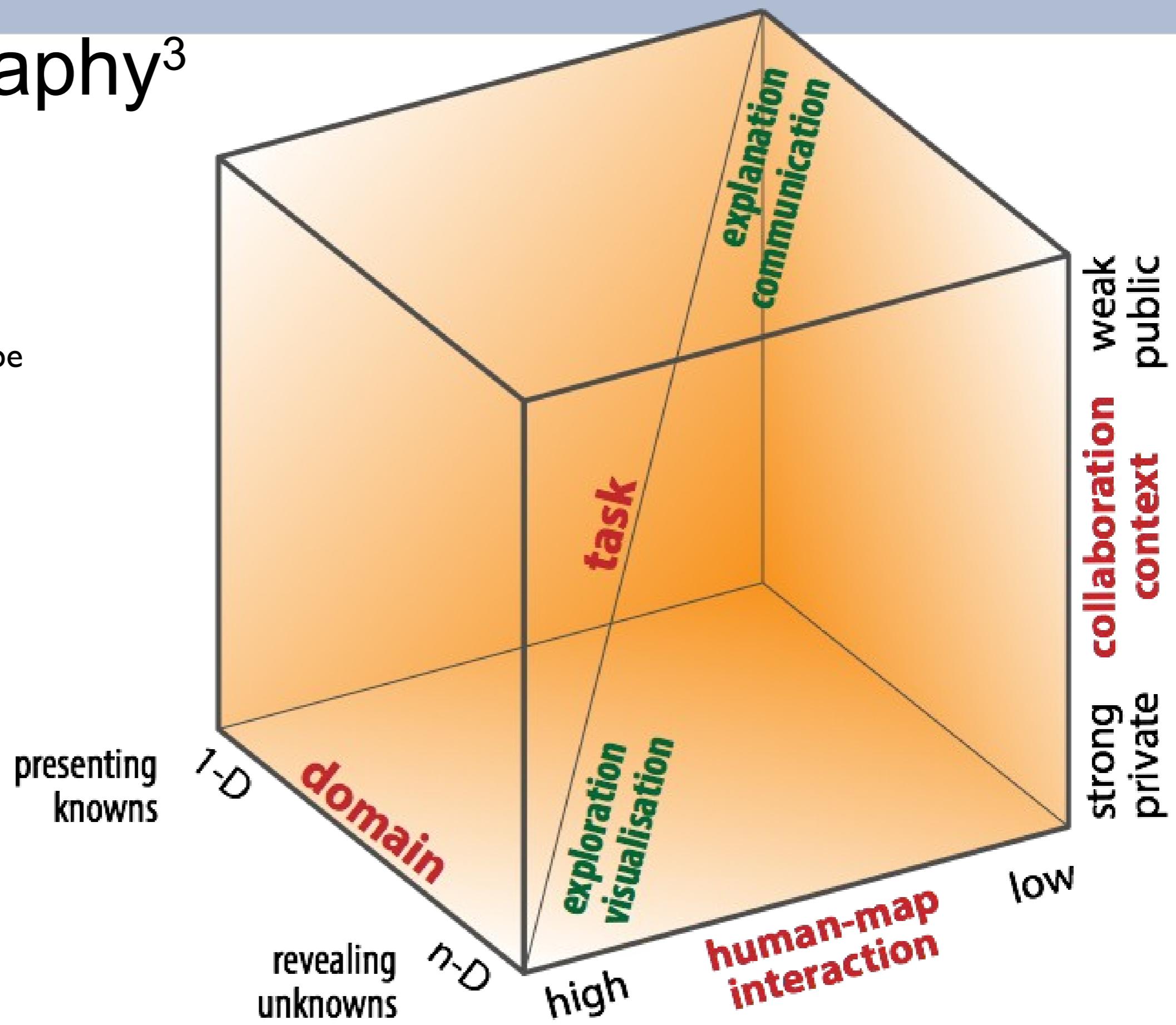
<http://www.economist.com/node/15557443>

Geovisualization and big data

- Find patterns and relationships in complex geospatial data
- Discovery of patterns and knowledge creation might be difficult, patterns might stay hidden
- Visuals stimulate pattern recognition and hypothesis generation

Cartography³

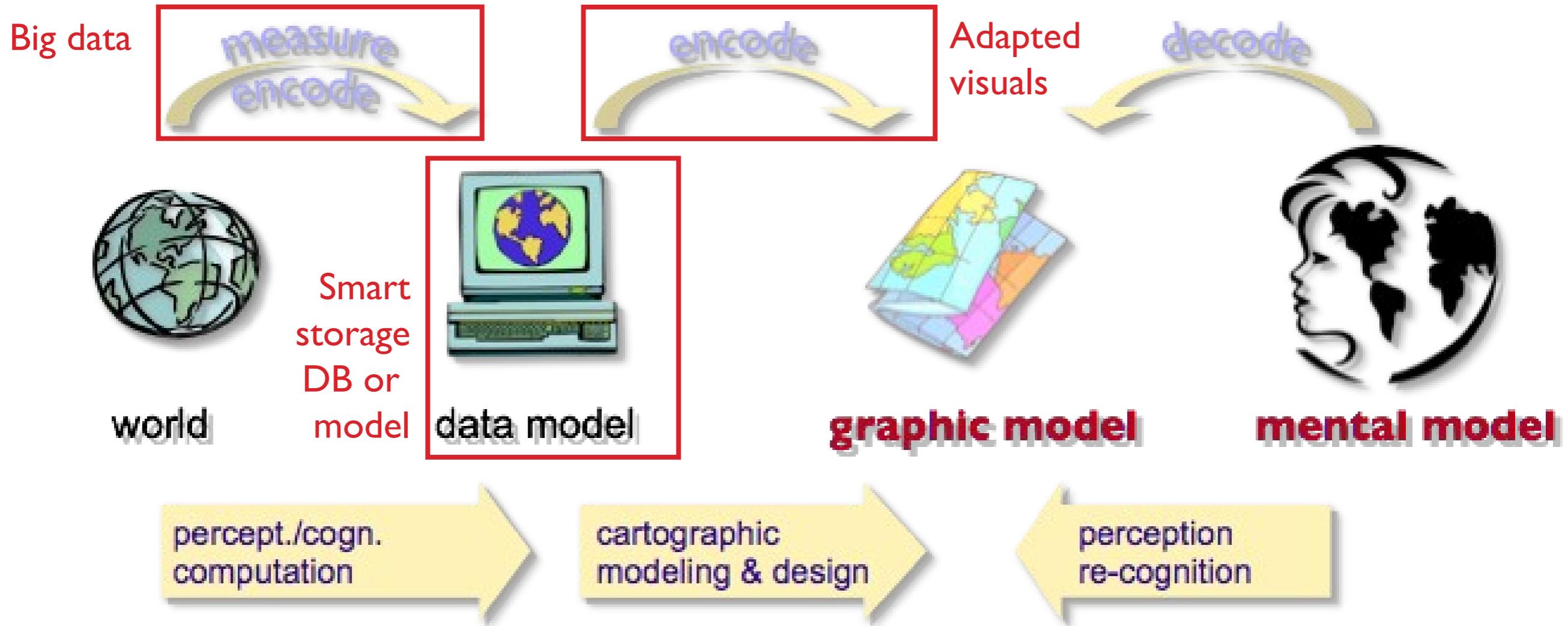
MacEachren's
geovisualisation cube



Big data in Geovis

Putting big data in visual form...

Raw data > data model > visual form > mental model



Framework for visual forms

- **Systematically** organise visual domain
- Understand **functions and uses** for different visual forms
- Informed decisions on **why, when and where** to apply which visual
- Based on the **aims / task / problem**



Functions of visual forms

- **Demonstrate**

- > photography, video,
virtual environment

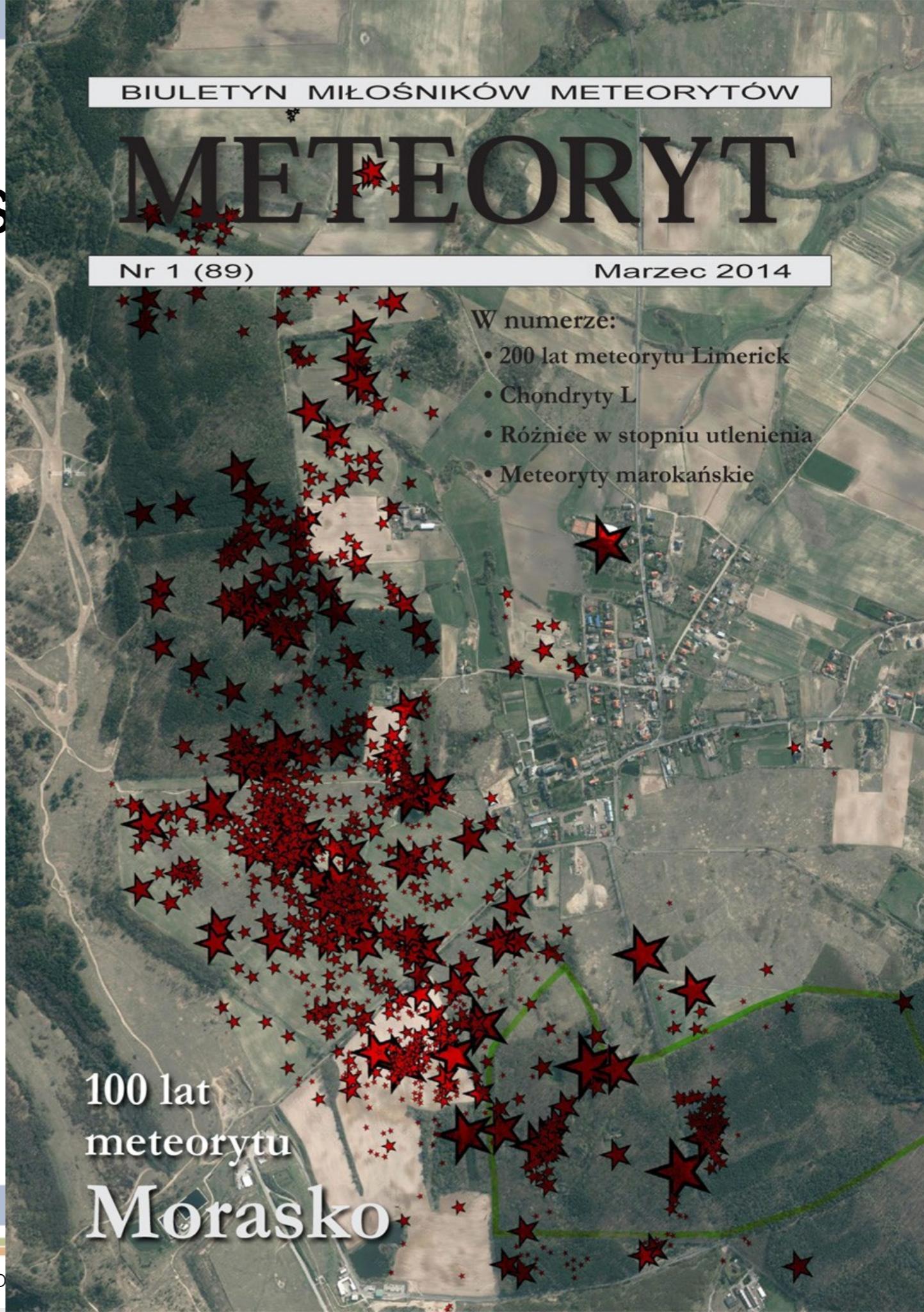


<https://youtu.be/rUKPl>

Functions of visual forms

- **Give a context**

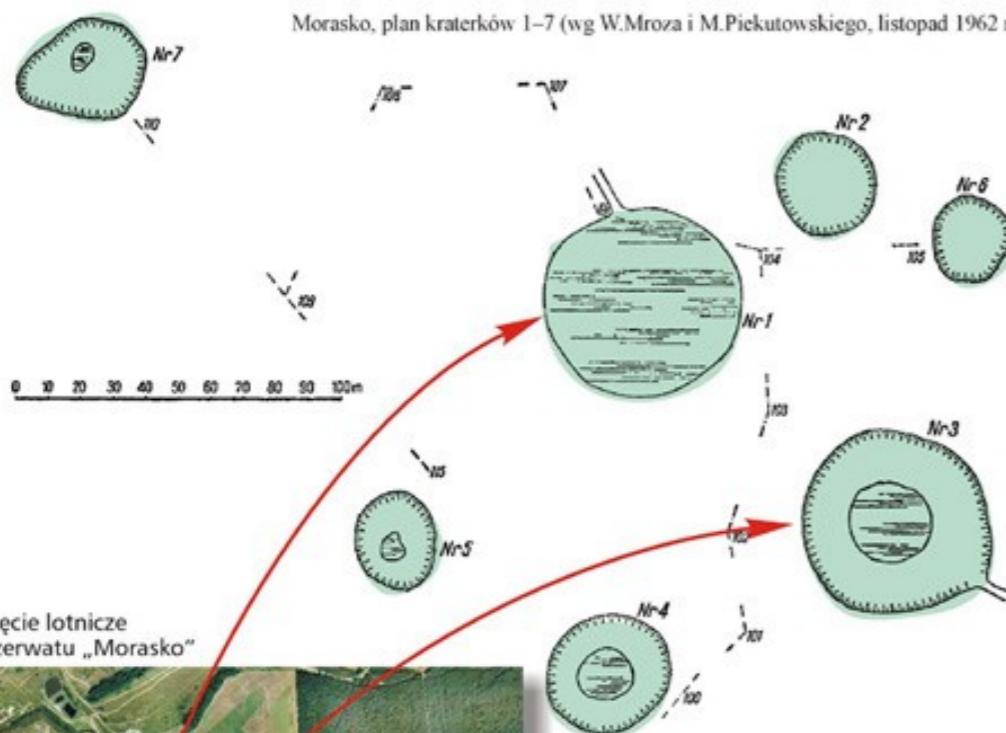
> map, system scheme



Żelazo na przedmieściach Poznania



Morasko, plan kraterów 1–7 (wg W.Mroza i M.Pickutowskiego, listopad 1962 r.)



Znaleziony przez dr Coblinera pierwszy okaz meteorytu Morasko



Z listu dr. Coblinera z 12 listopada 1914 r.:

Bei Schanzarbeiten fand ich heute im gewachsenen Boden (Kies) ungefähr einen halben Meter unter der Erdoberfläche einen Metallkumpen von 77,5 Kg. Gewicht.

Jest to informacja o pierwszym znalezionym meteorycie Morasko. Okaz jest w zbiorach Muzeum Geologicznego Instytutu Nauk Geologicznych PAN w Krakowie.

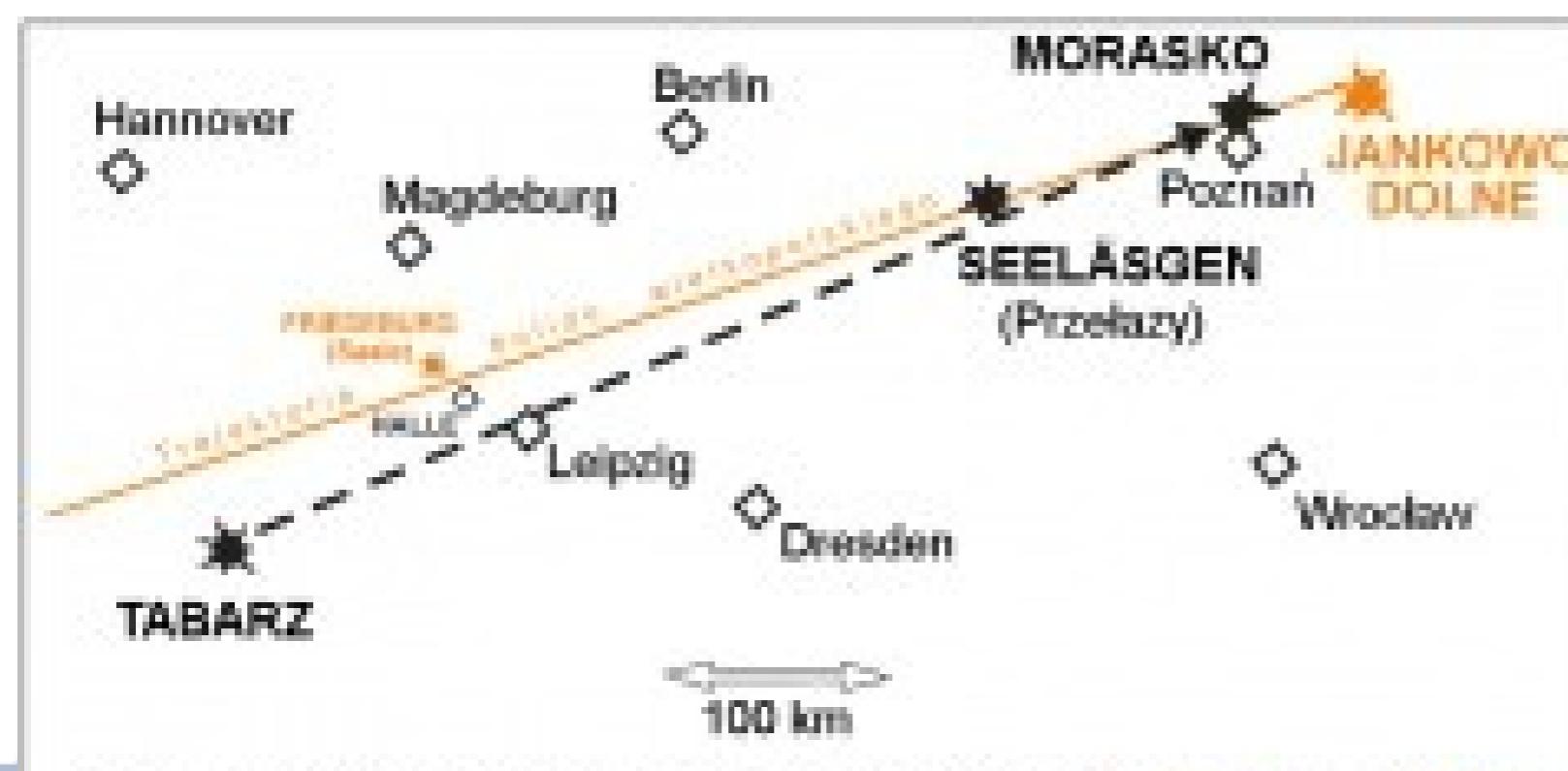
W latach pięćdziesiątych XX w. Moraska szukał Jerzy Pokrzywnicki. Zaprosił nawet do współpracy saperów z wykrywaczami min, ale bez powodzenia. Znalazł natomiast meteoryty u gospodarzy, którzy wcześniej wyorali je na polach. Uczony wysunął przypuszczenie, że pochodzą z zagłębień terenu widocznych w okolicy – kraterów meteorytowych. We wrześniu 2006 r. Krzysztof Socha odnalazł Morasko ważące 178 kg (po oczyszczeniu 164)!

Meteorytów żelaznych spada tylko 4%, ale są względnie „łatwe” do znalezienia. Bardzo ciężki, rdzawy kamień zwraca na siebie uwagę. W trakcie prac polowych czy na budowach wielokrotnie znajdowano bryły żelaza. Nieraz okazywały się one meteorytami. Tak było w przypadku większości polskich meteorytów żelaznych. Morasko znaleziono podczas budowy umocnień wojskowych, na Przełazy natknął się rolnik kopiący rów melioracyjny, Świecie ujrzało światło dzienne podczas niwelacji terenu przy budowie kolei.

źródło: Muzeum Geologiczne ING PAN Kraków, Internet

Functions of visual forms

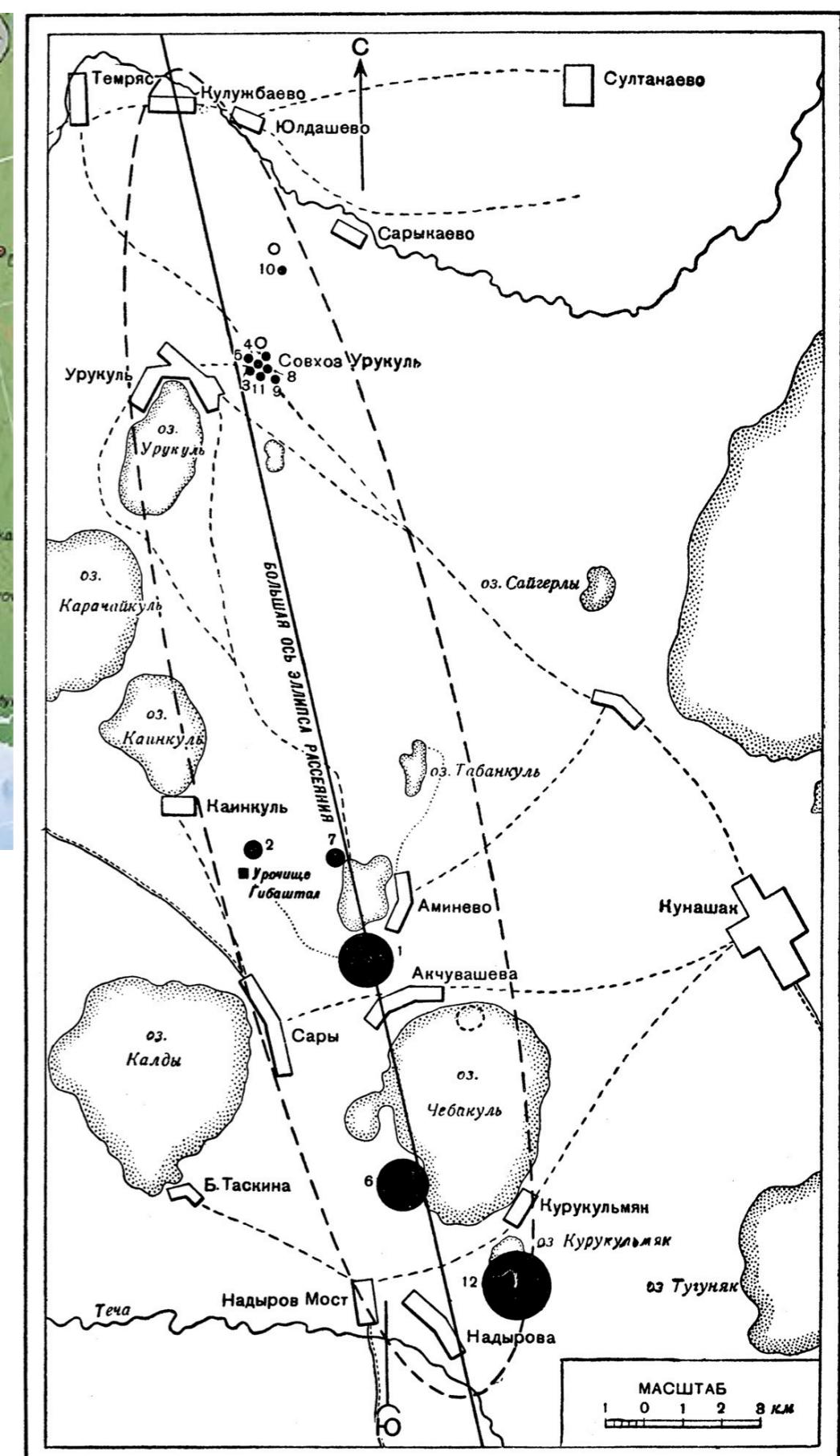
- **Help to mental construction** (concept, structure, links)
 - > text, map, scheme, abstract animation



Meteorite fall area: Tabarz, Seelasoen, Morasko, Jankowo Dolne

06.2017

Geovisualization



Фиг. 5. Схема эллипса рассеяния каменного метеоритного дождя Кунашак. Черными кружками показаны места находок индивидуальных экземпляров; размеры кружков соответствуют относительным размерам метеоритов. Светлыми кружками указаны места находок несохранившихся индивидуальных экземпляров. Пунктирными кружками показаны места предполагаемых падений индивидуальных экземпляров

Functions of visual forms

- **Motivate** (catch attention, mindfullness)
 - > animation, video, interactive application



<https://youtu.be/UdIEEfzH64w>



Range of visual forms

Visual forms can be classified :

- By type : photography, graph, diagramm, map
- By production type / display : printed, digital, 2D/3D...
- Realistic <> Abstract
- Discrete <> Continuous
- Static <> Interactive
- Pre-defined <> dynamic (on-demand)

•Realistic <> Abstract

specificity

generalizability

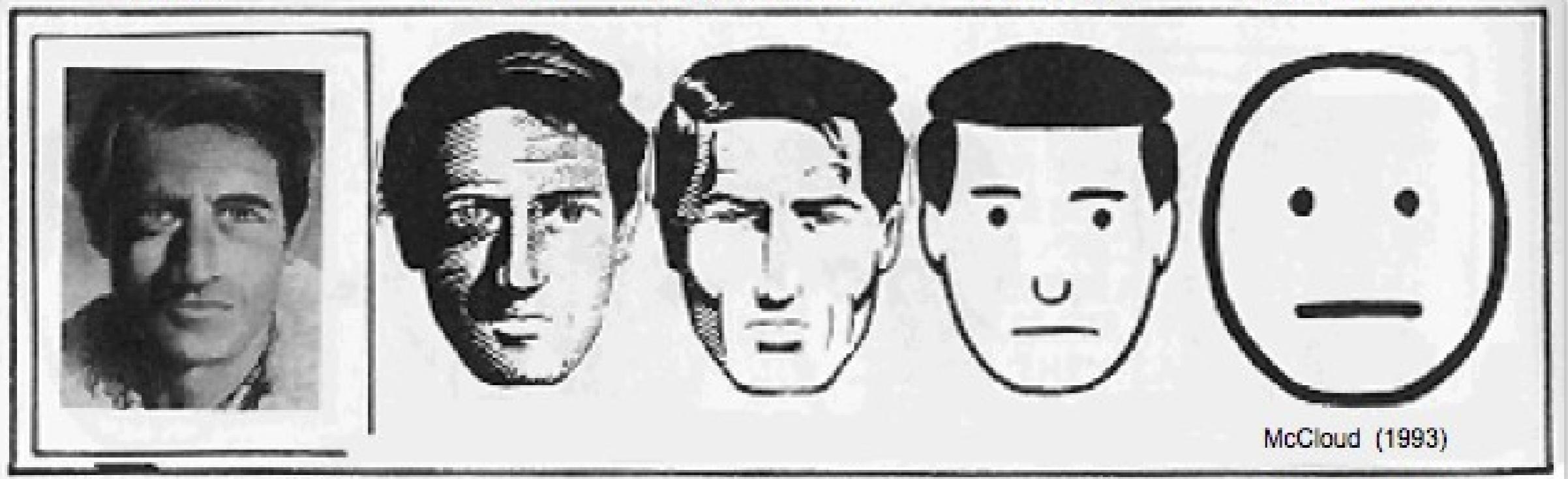
one

a few

thousands

millions

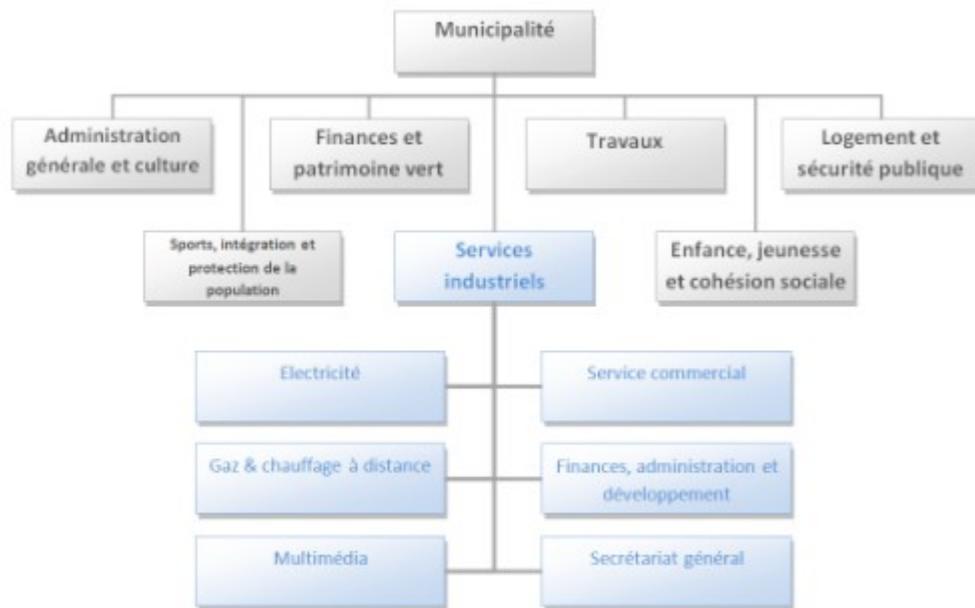
nearly all



2D image

2D symbol

Realistic <> Abstract



Organigramme des Services industriels de Lausanne

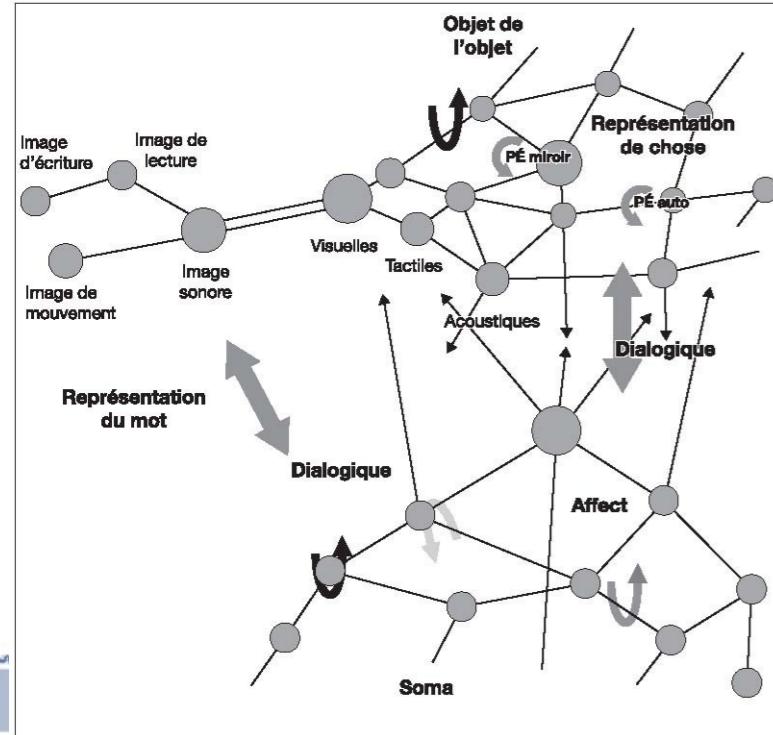


Schéma de la représentation de chose dans ses dialogiques avec la représentation de mot et l'affect.
In Roussillon (2007) La représentance et l'actualisation pulsionnelle.

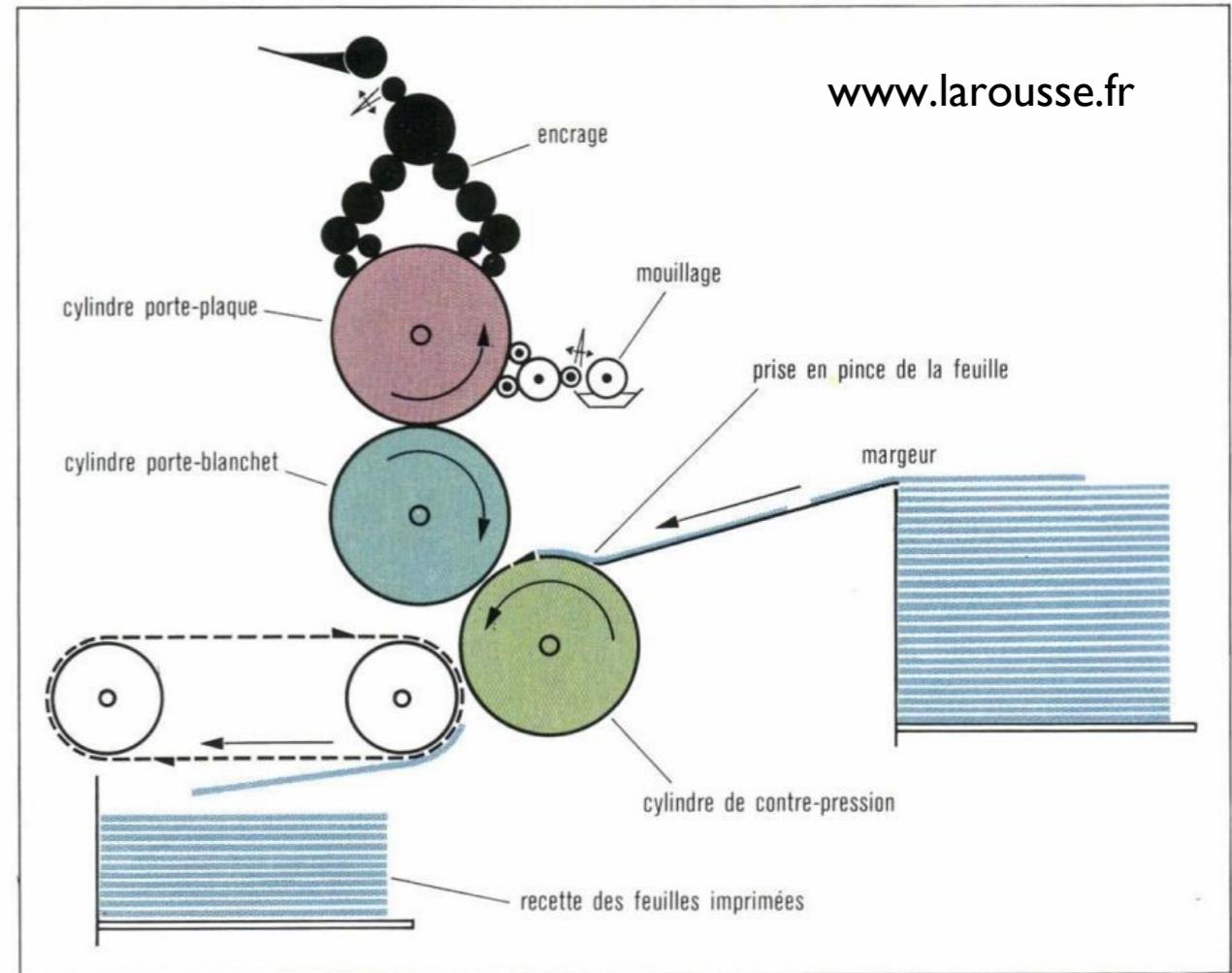
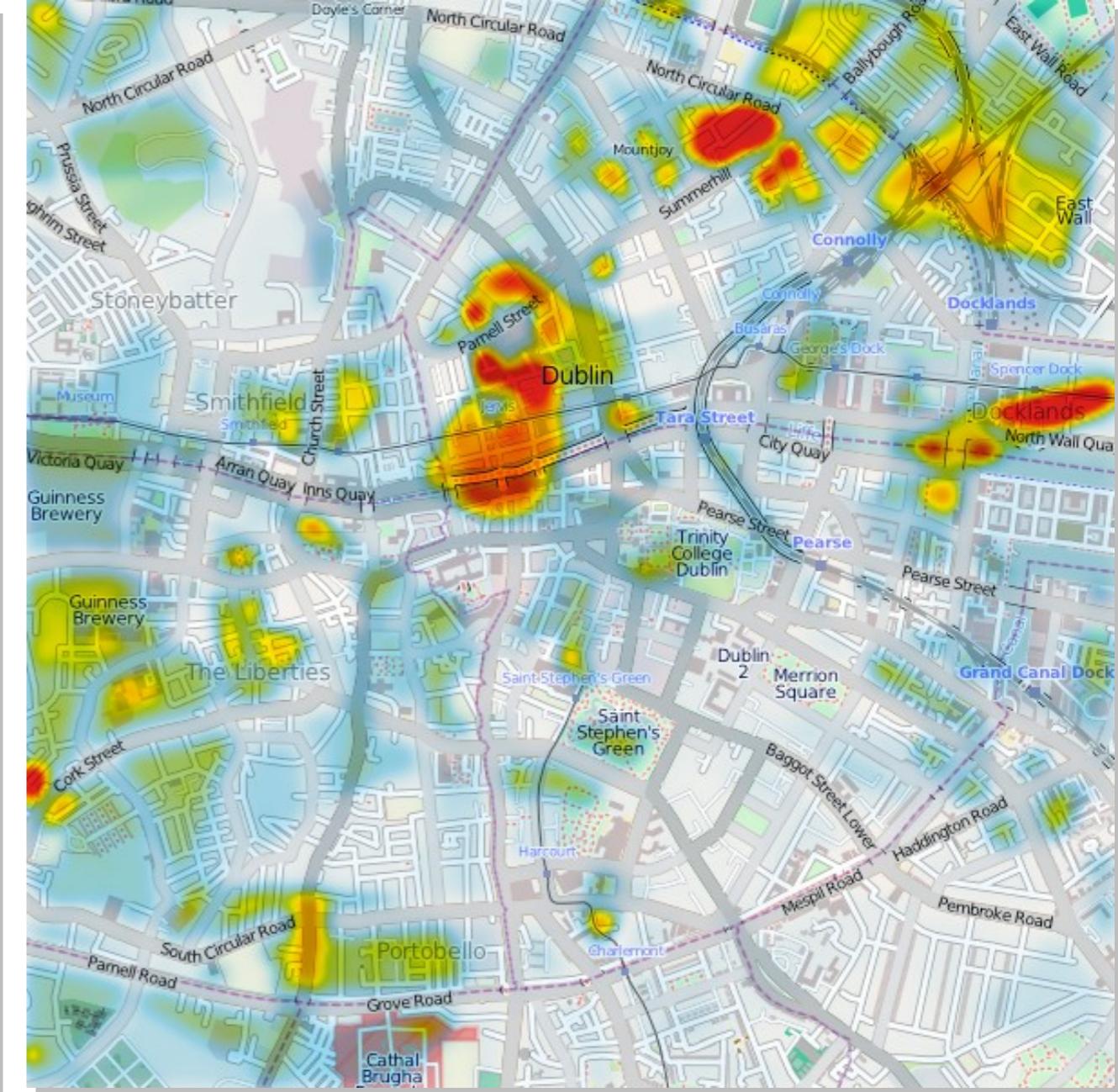


Schéma d'une presse offset à une couleur.



Realistic <> Abstract



Sunday, 28 November 2009 at 4PM in the Centre of Dublin

Static <> **Interactive**
Pre-defined <> **Dynamic** (on-demand)

Typology of interactivity in Geovisualization

Interaction with the data representation

- Zoom, pan, changing view point (camera), changing orientation of the data, change of scale

Interacting with the temporal dimension

- Navigation, fly-by or fly-throughs, toggling, sorting

Interaction with the data

- Database querying, data mining; geographic, statistical and temporal brushing; filtering, highlighting

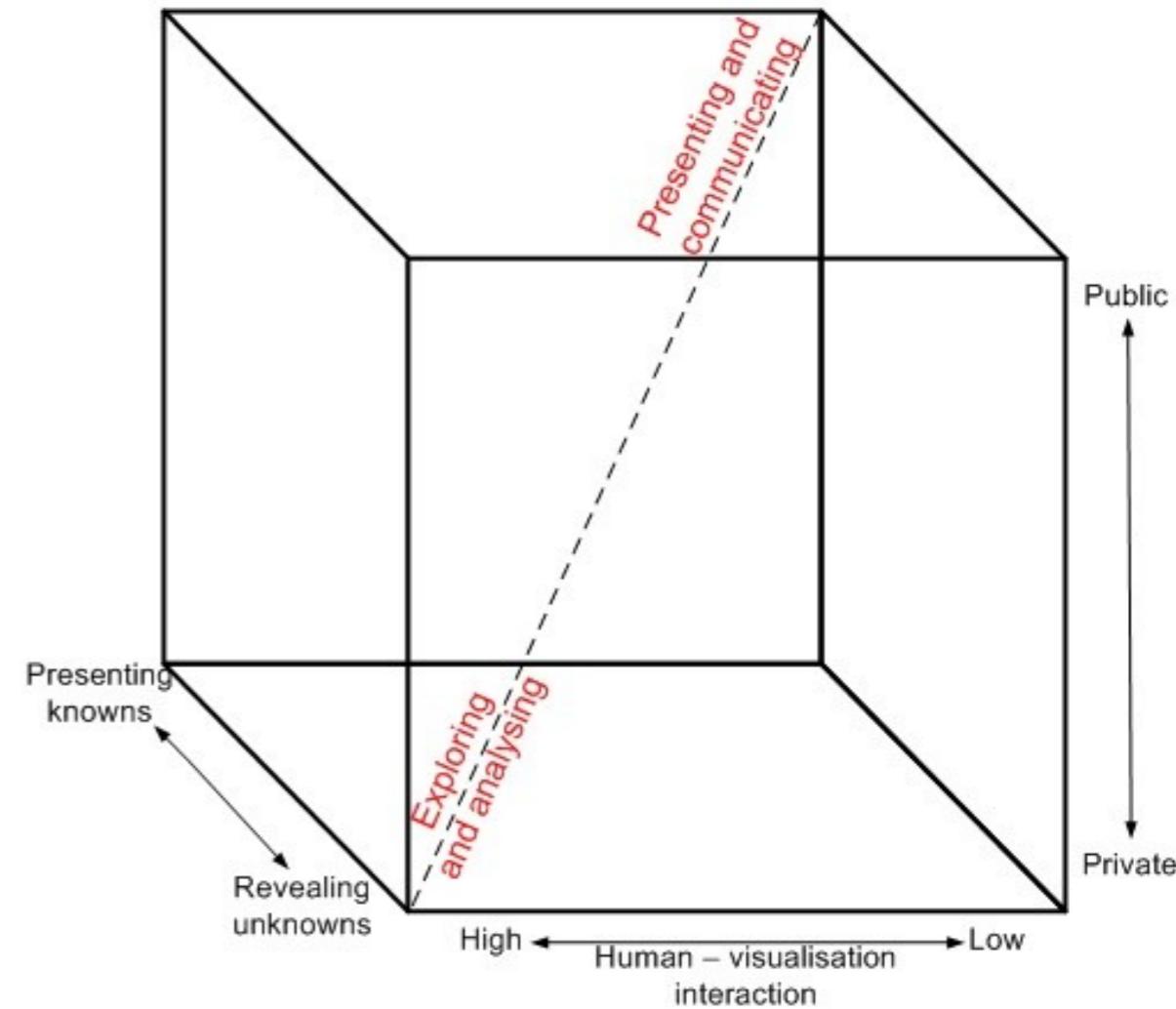
Contextualising interaction

- Multiple views, combining data layers, window juxtaposition, linking

(J. Crampton. Interactivity Types in Geographic Visualization, Cartography and Geographic Information .Science 29(2) 2002, p.85-98)

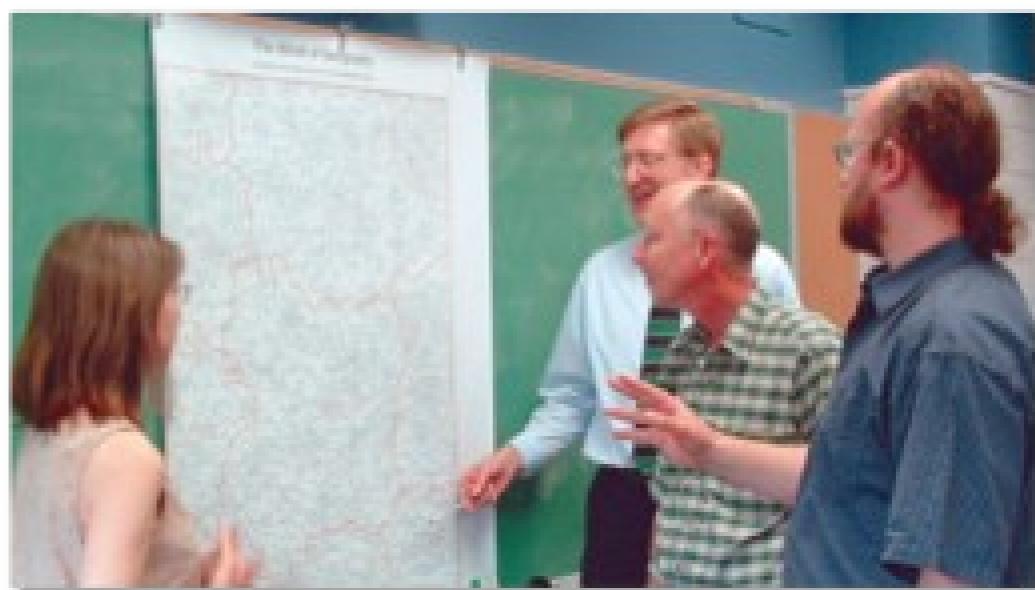
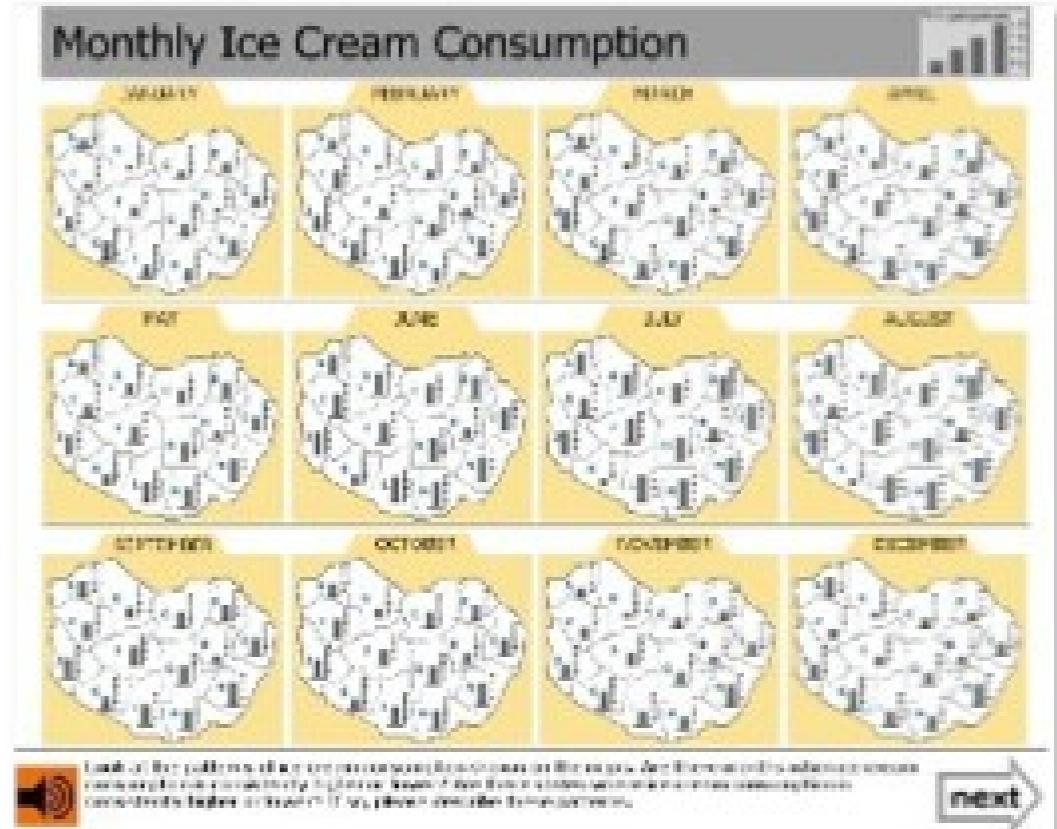
Levels of interactivity

- 5 levels of interactivity
- Continuum along one side of the map cube
- Which, when, where most appropriate?
 - Depends on purpose and audience!
- Goal: you should be able to select the appropriate level!



Level 1: Static

- No explicit interactivity at all
- Look → decode → (hopefully) understand!
- Implicit interactivity
- Look at symbols and use legend to understand symbols
- Little to no manipulation
- **When / why static level is useful?**



Level 2: Animation

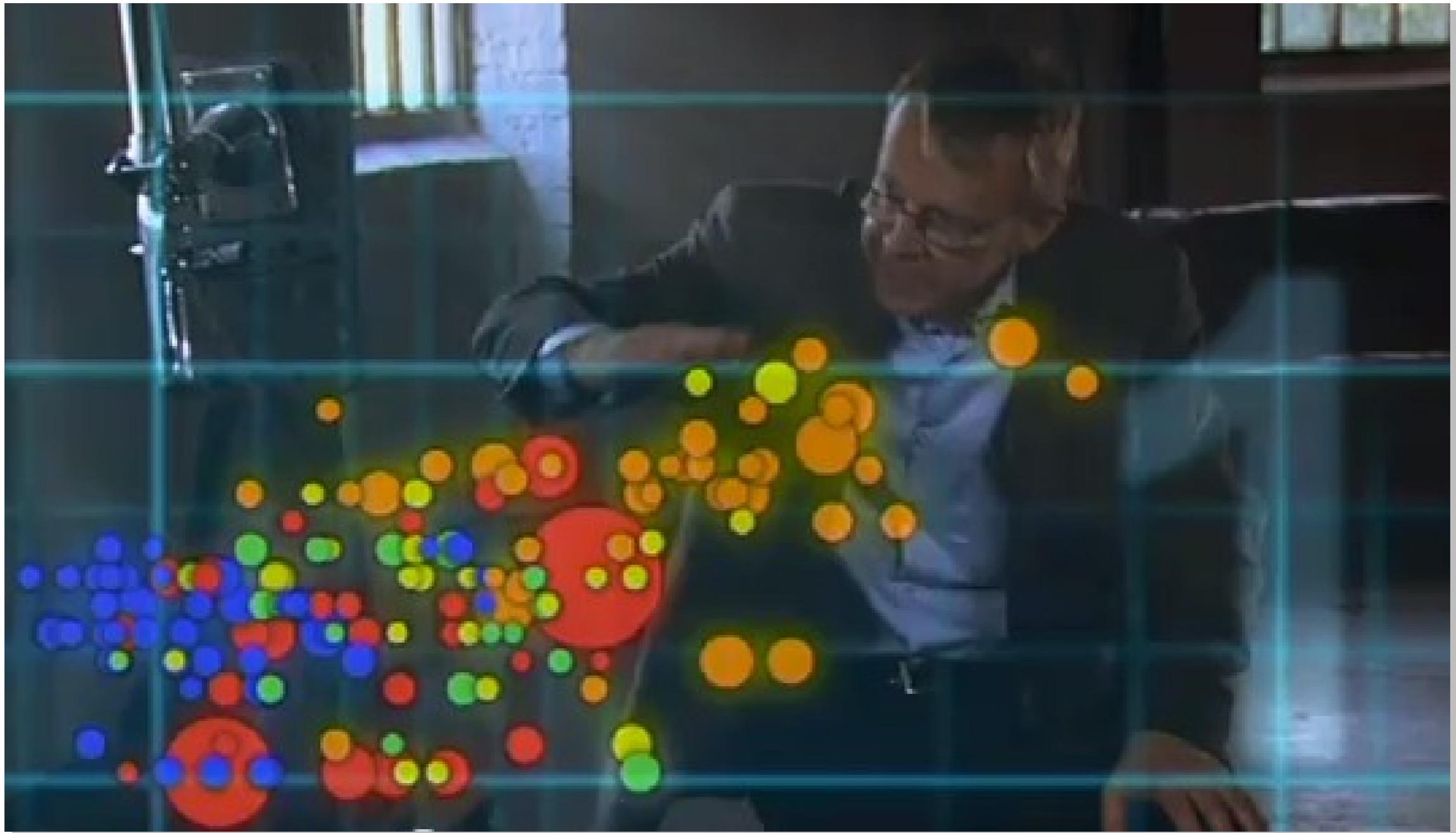
- Illustrative animation can tell a story
- Limited to pre-built sequence
 - Low interaction level: play, stop, loop, rewind
- Passive monitoring of a model
- Animation ≠ Interactivity
- When / why animation could be useful?

Animation: example...



<http://www.youtube.com/watch?v=Qz3BF3Njx-k>

Animation: example...

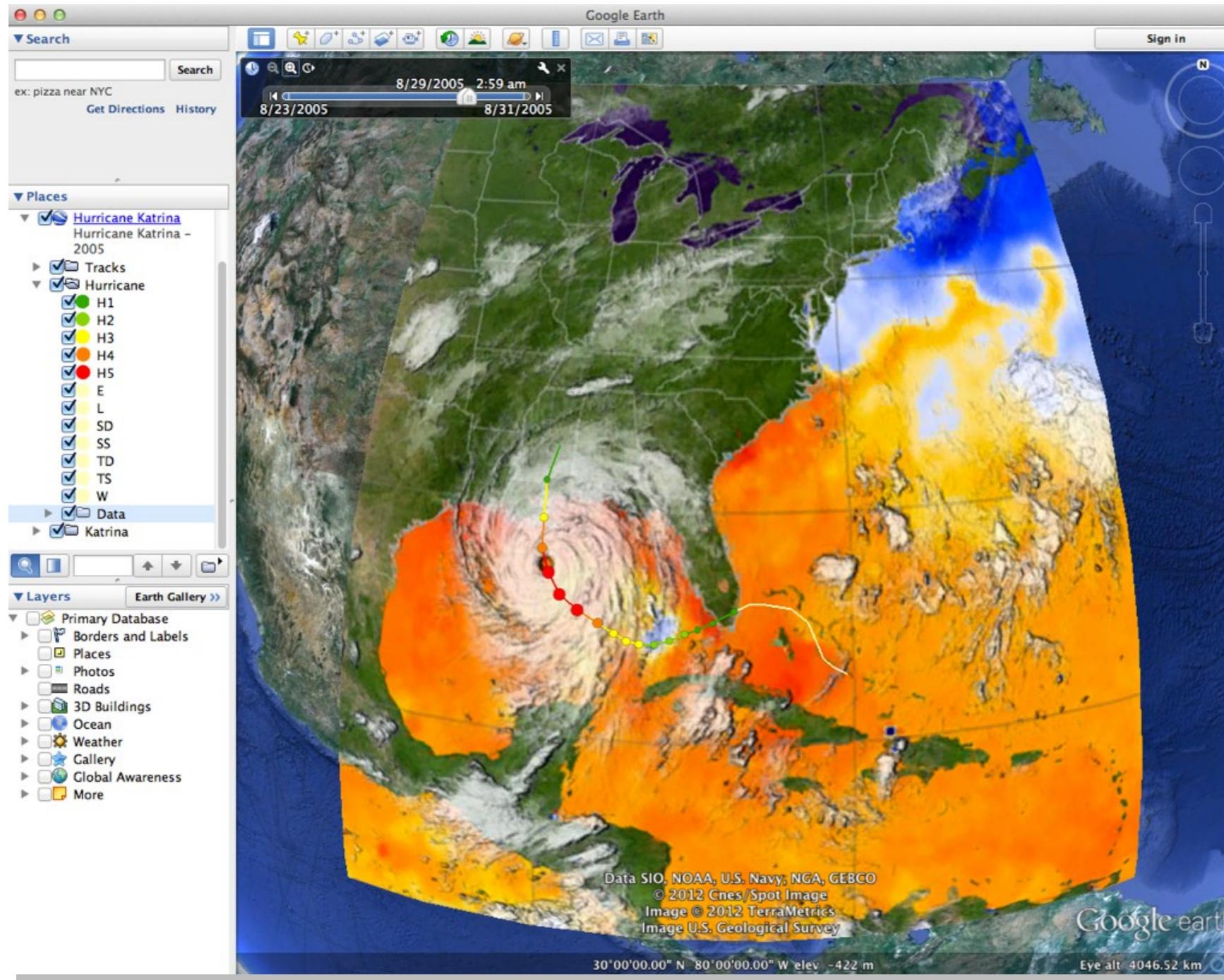


<http://www.youtube.com/watch?v=jbkSRLYSojo>

Level 3: Sequencing

- Controlled interaction of linear sequence
 - Modify speed and direction of animation
- Buttons provide some interactivity
 - Zoom in and out, select other view
- Geographic visualisation / ESDA
 - e.g. sequencing of choropleth maps (Slocum)

Level 3: Sequencing



«The amazing things
about Google Earth...»

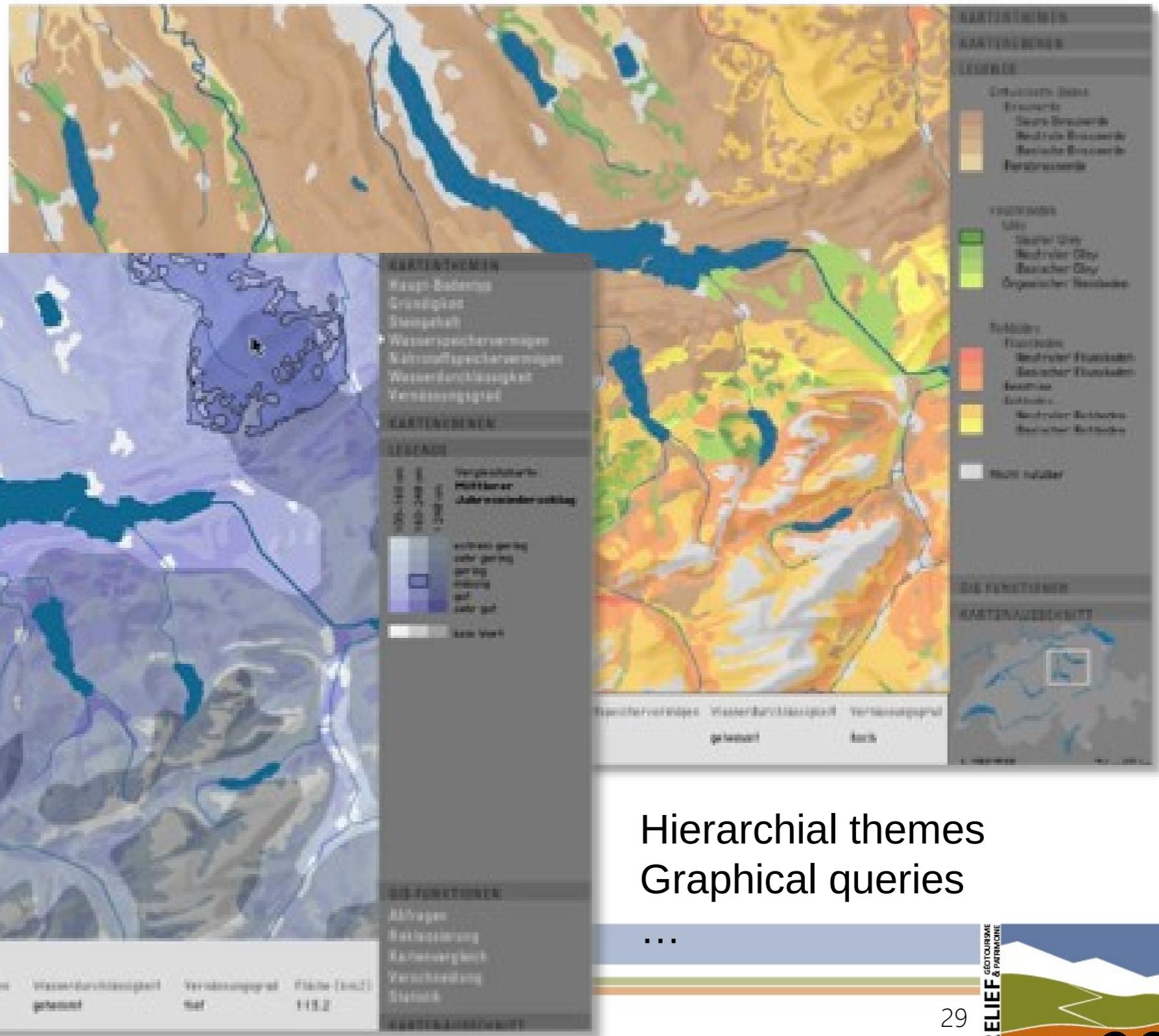
Hurricane Katrina

Level 4: Hierarchical interactivity

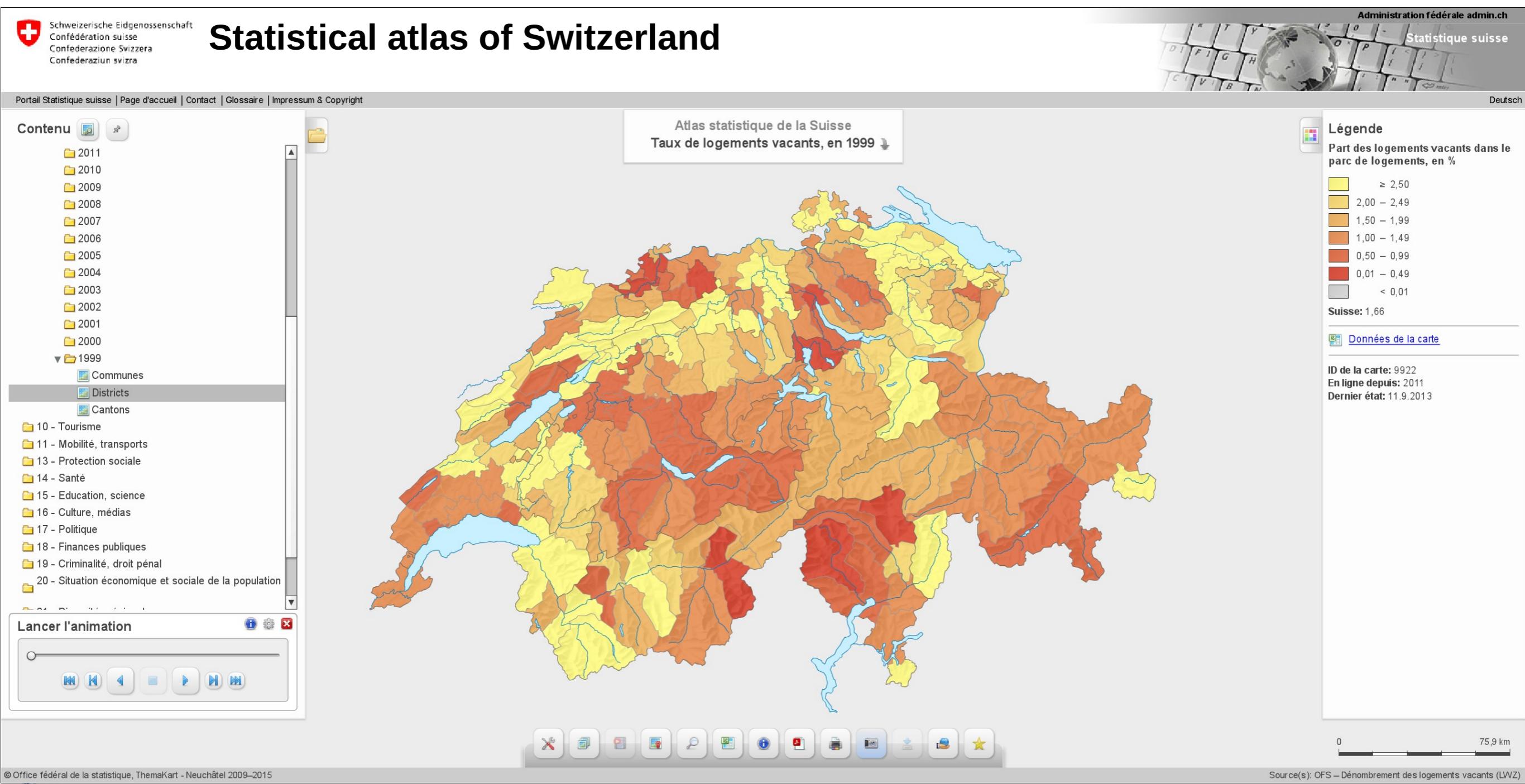
- Non-linear organisation principle of information
 - Still pre-defined by designer
- Information trees with links and nodes
 - E.g. library catalogs, file systems
- Interaction along links and nodes of hierarchy
 - E.g. hypermedia
- Interrogate depth and detail of information
- Reveal hierarchical connections and relationships

Hierarchical interactivity: example...

Atlas of Switzerland



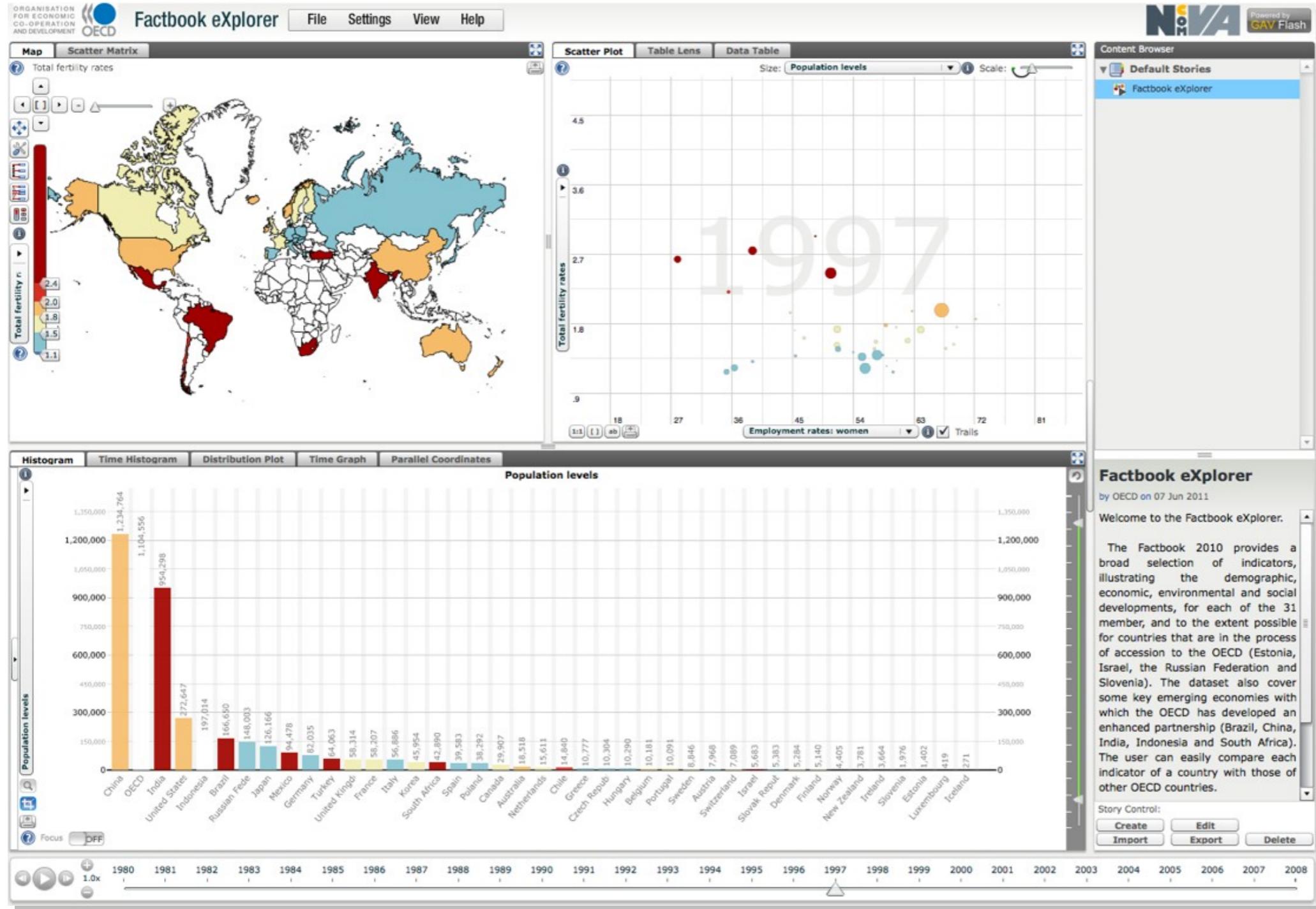
Hierarchical interactivity: example...



Level 5: Conditional interactivity

- As good as it gets until now!
- Real-time graphic solutions based on predefined rules
 - E.g. brushing, linked windows
- Event based
 - Unexpected outcomes possible based on starting conditions
 - E.g. geo-simulation, dynamic models, ...
- Real-time simulation or «what-if» modelling (scenarii)
 - Pro-active graphics (GViz: Buttenfield, 1993)
 - Steering, flow modelling (ViSc: Rosenblum, 1990)

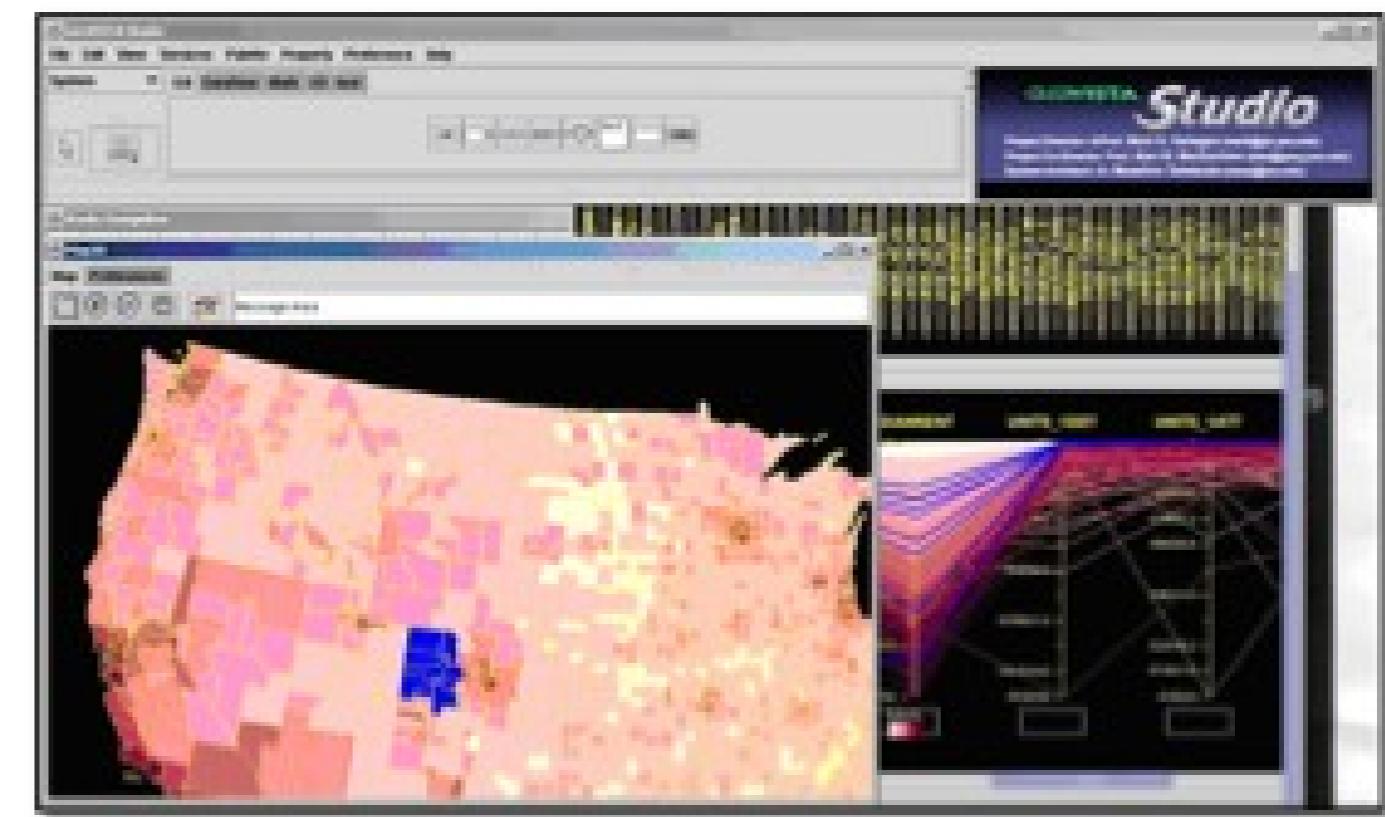
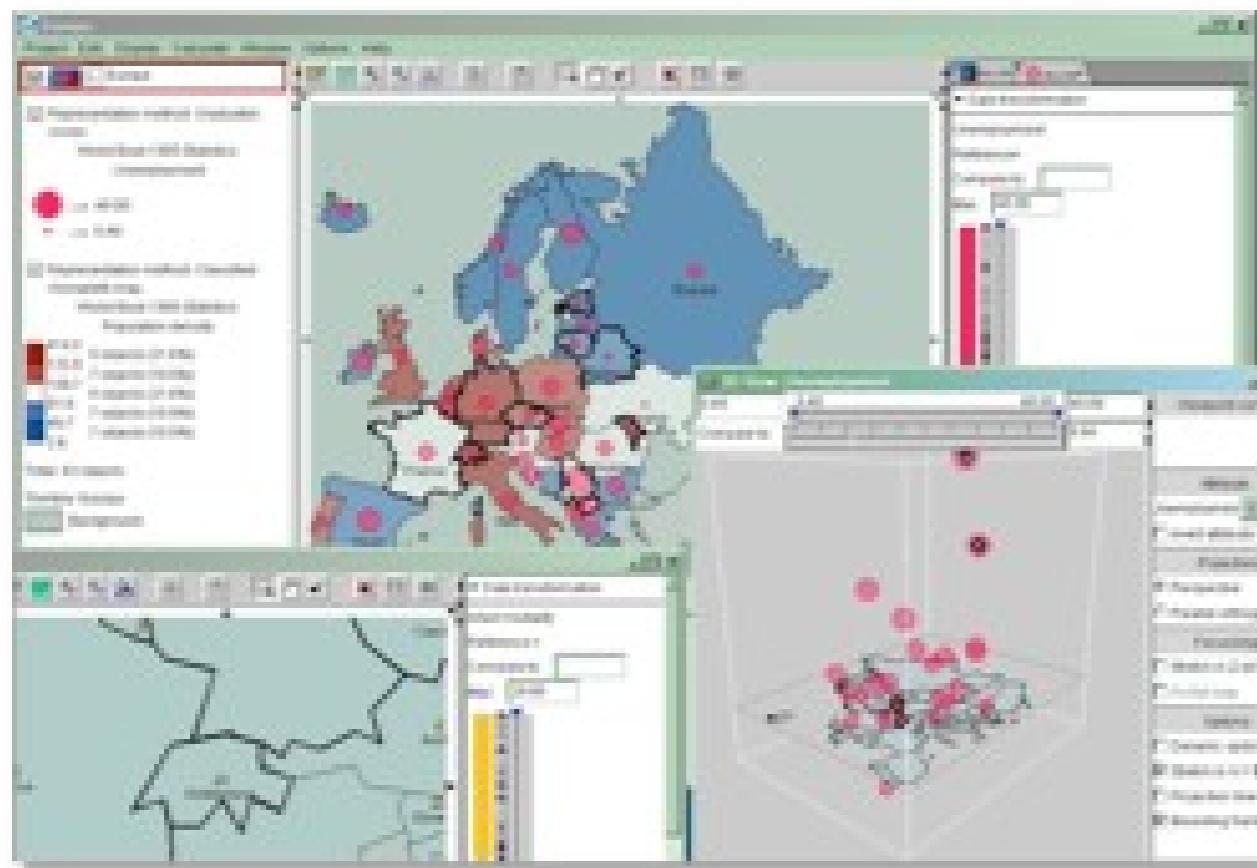
Conditional interactivity: example...



OECD Factbook
eXplorer

<http://stats.oecd.org/oecdfactbook/>

Conditional interactivity: example...



G. & N. Andrienko, CommonGIS

Gahegan et al., GeoVISTA Studio

Interactivity: wrap up

Interactivity in GeoVis is ...

What/how users can manipulate what they see

What/how users can manipulate to make visible what they do not see

Five levels ...

static → animated → sequential → hierarchical → conditional

Determining appropriate interactivity level for context ...

Task / problem at hand; Theme, Audience

Cartography³

MacEachren's
geovisualisation cube

