

Filtrage interactif de données multi-dimensionnelles



Patrick Brockmann
LSCE (UMR 8212 / CEA-CNRS-UVSQ)

SIST 2016 : Séries Interopérables et Systèmes de Traitement
29-30 sept. 2016 Montpellier (France)

Un partage d'expérience sur la réalisation d'une application d'exploration de données

Contexte

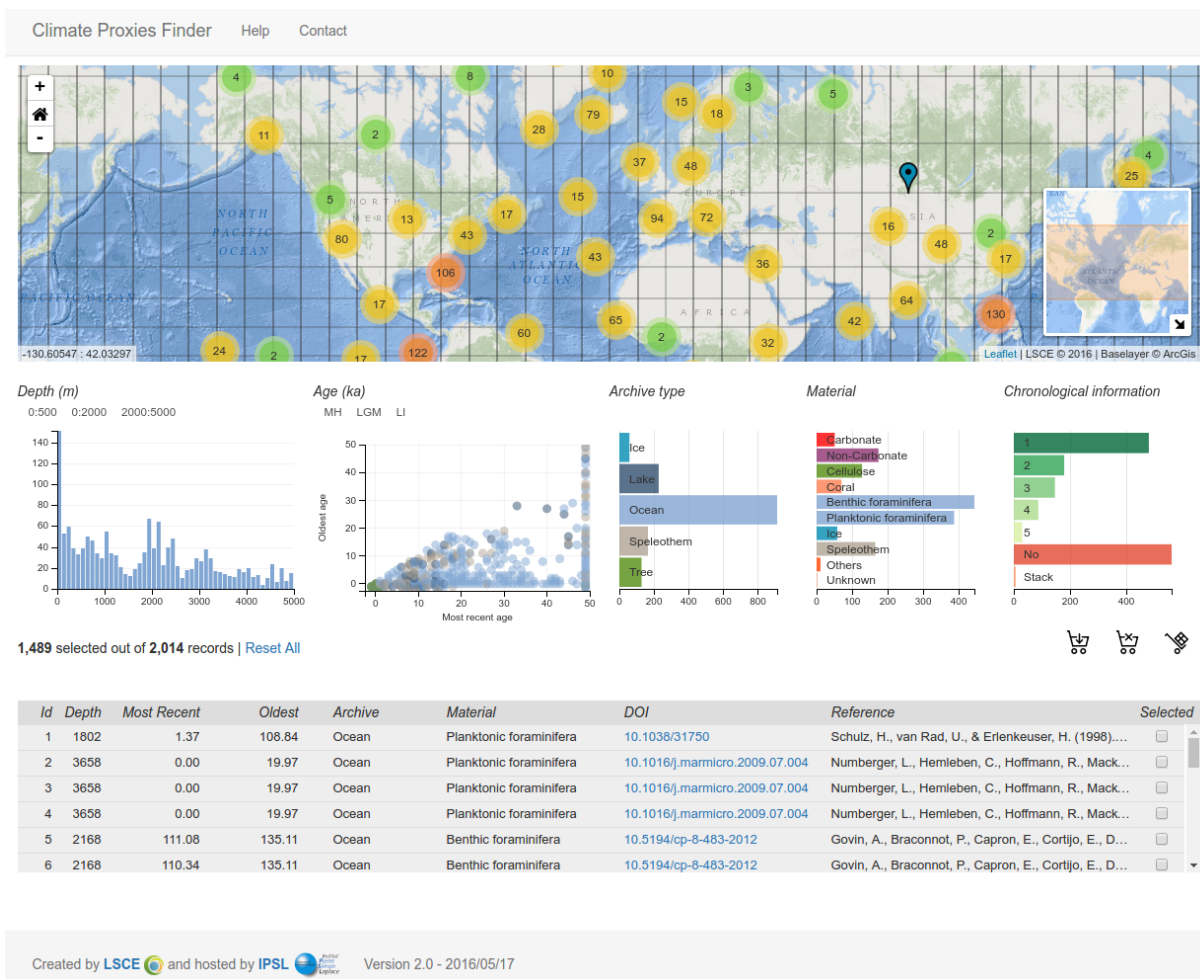
- Données paléoclimatiques
- Renfort sur un projet en cours

Problématiques

- Vérification des traitements
- Analyse exploratoire
- Diffusion des résultats

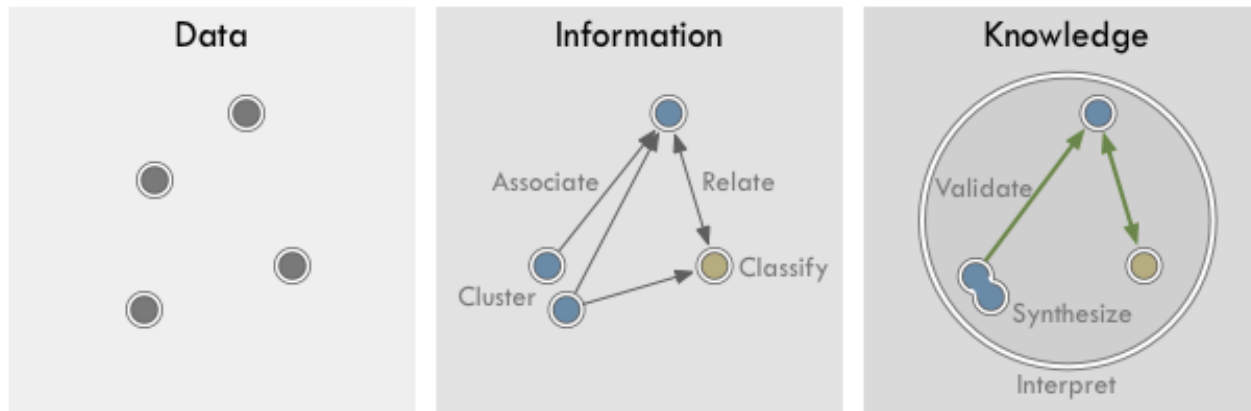
Ressources

- 1 personne sur quelques semaines



Motivations

Accompagner la Recherche sur la transformation des Données en Informations et en Connaissances.



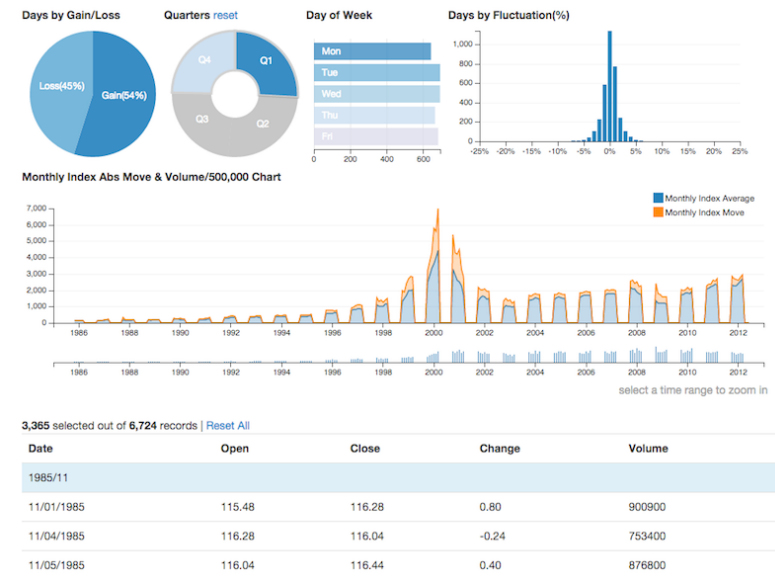
Comment ?

En concevant des applications avec des tableaux de bord interactifs

Pourquoi ?

Parce que organiser, filtrer les différentes propriétés des données (leurs *dimensions*), puis les grouper, les associer, les agréger permet de

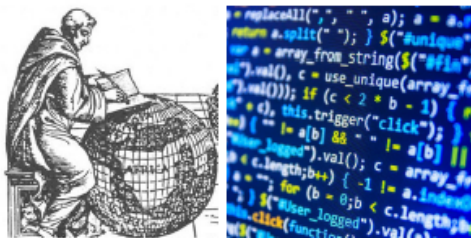
- Trouver des relations entre les données
- Vérifier les données en les visualisant
- Interpréter l'information produite
- Etablir des connaissances



Climate data analysis produces large-scale and multi-attribute data. How can these results be explored? What can be done to better explore these data? What are the essential findings? What is the best technical way to communicate them? These are critical questions that interactive, web-based data visualization can help answer.

Products

We use web technology to create interactive graphics that are displayed in the browser. This is especially useful to see the effect of changing the value of an attribute on a variable of interest or provide a synthesized view of a complex dataset. The visualizations we produce can be included as figures (with online links) in journal publications, websites, blogs, or can be exploratory tools hosted as web platforms.



Modern data visualization is produced with code that uses specialized libraries (e.g. d3.js, dc.js, crossfilter.js).

Does data vis replace your analysis tools?

No. Data vis comes at the end of the pipeline, after you have analyzed your data in Python, R, or Ferret, for example.

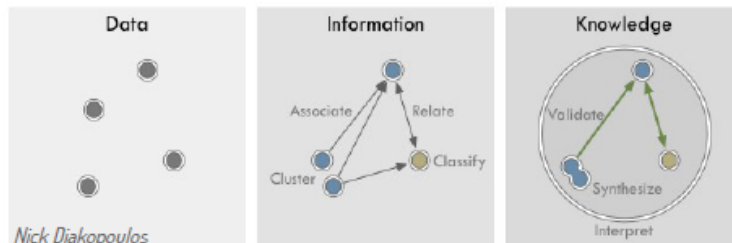
What is the role of data visualization?

Data visualization transforms data (numerical values) into information by showing how they are related. Knowledge is produced when information is interpreted, analyzed and judged to inform decision-making or further analysis.

Design process

Visualization ideas are conceived based on your needs, the technologies at our disposal, and the target users. The process then iteratively evolves by prototyping, testing, and getting feedback.

1. Define objective and target users
2. Find the story in the data
collaborative effort with scientists
3. Build web-based visualization
feedback & iteration
4. Disseminate
publications, local /public sites, blogs...

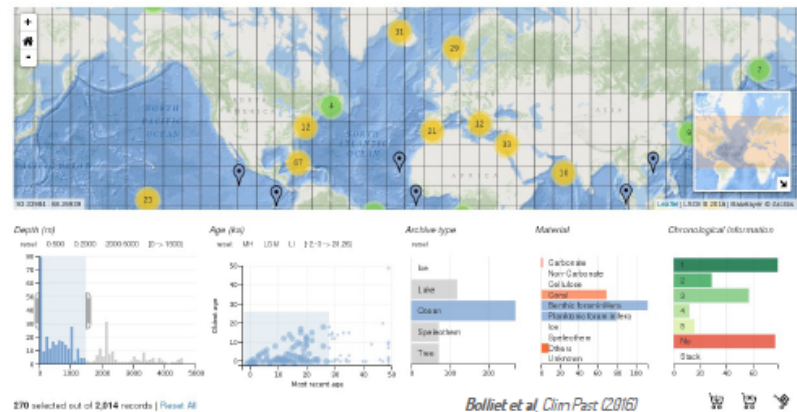


Nick Diakopoulos

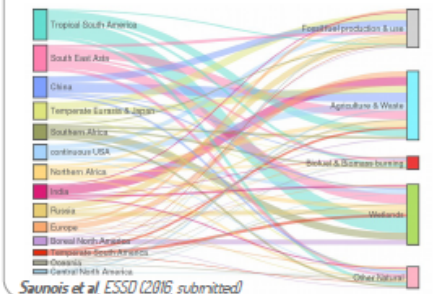
Our mission : create data visualizations for the interactive exploration, discovery and communication of data.

We have made exploratory tools for climate proxies, analogues of circulation, models of climate indices, and bibliographic data, as well as interactive graphics for coastal CO2 fluxes, CO2 and methane emissions.

Climate Proxies Finder – linked charts and map filterable by ocean proxy attributes

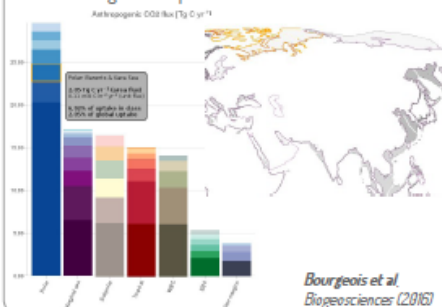


CH4 Emissions – Sankey diagram for different sources



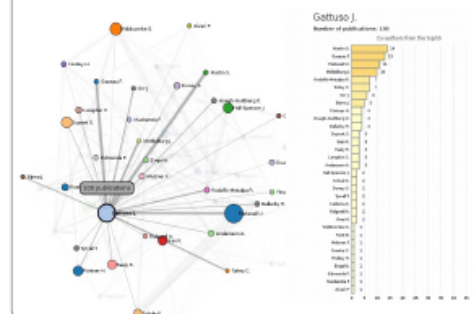
Saunio et al. ESSD (2016, submitted)

Coastal CO2 flux – linked stacked bar chart with coastal regions map

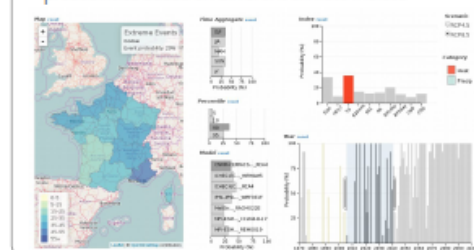


Bourgeois et al. Biogeosciences (2016)

Bibliograph – searchable network graph for the ocean acidification community (OA-ICC database)



Extremoscope – linked dashboard for extreme event probabilities based on different climate indices



Demo time !



<http://climateproxiesfinder.ipsl.fr/screencast.mp4>

Architecture

front-end versus back-end

Ici tout ou presque est
du côté navigateur !

Frontend



vs



Backend



dc.js - Dimensional Charting Javascript Library

dc.js is a javascript charting library with native [crossfilter](#) support and allowing highly efficient exploration on large multi-dimensional dataset (inspired by crossfilter's demo). It leverages [d3](#) engine to render charts in css friendly svg format. Charts rendered using dc.js are naturally data driven and reactive therefore providing instant feedback on user's interaction. The main objective of this project is to provide an easy yet powerful javascript library which can be utilized to perform data visualization and analysis in browser as well as on mobile device.



Crossfilter

Fast Multidimensional Filtering for Coordinated Views

Pre-processing



Jupyter Notebook



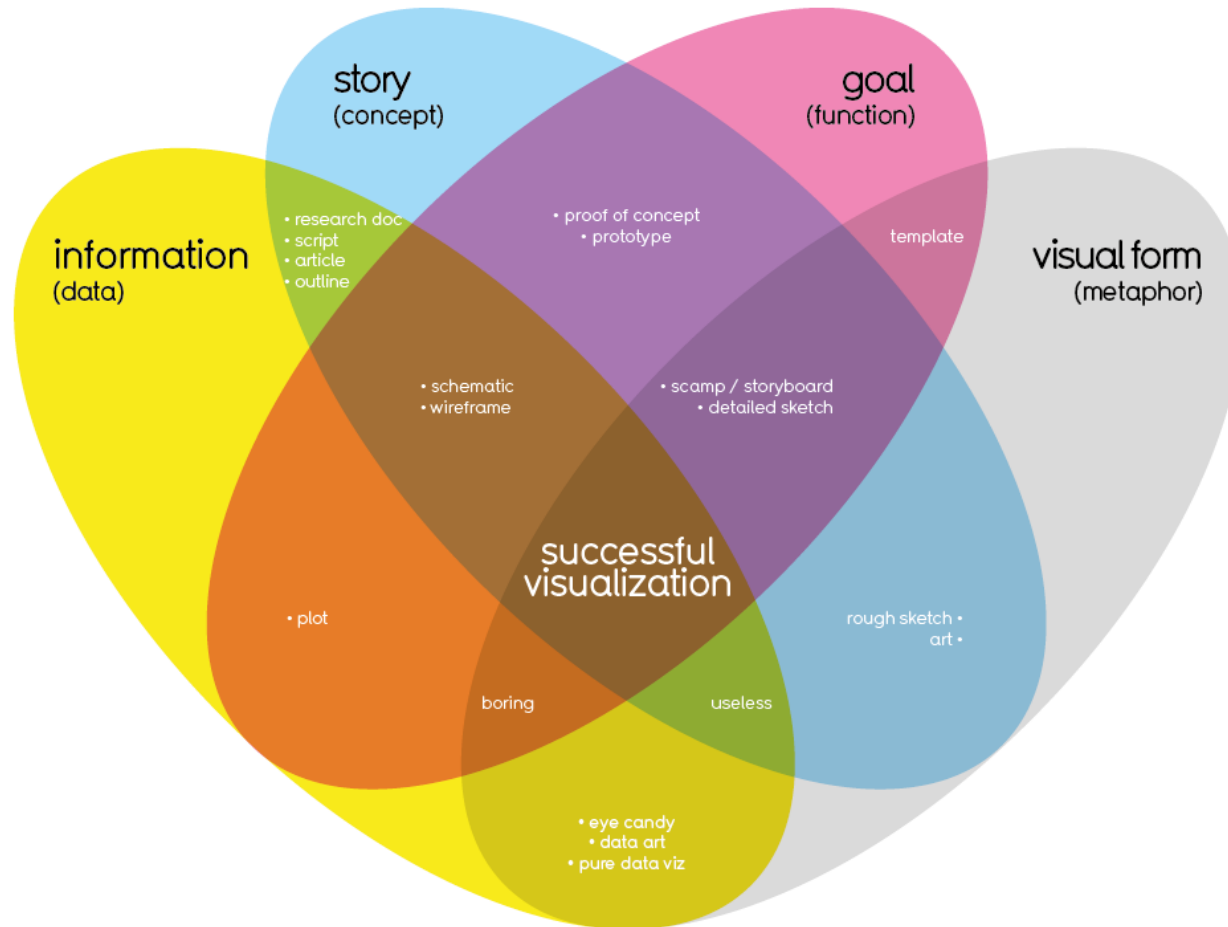
Gestion de code



rollover for more detail

What Makes a Good Visualization?

explicit (implicit)

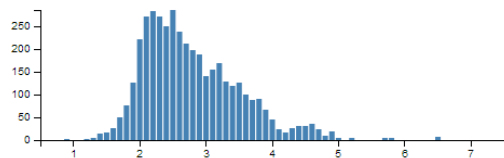


David McCandless
InformationIsBeautiful.net

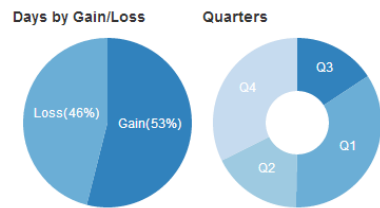
taken from new book
Knowledge is Beautiful

find out more
bit.ly/KIB_Books

Les différents charts de dc.js

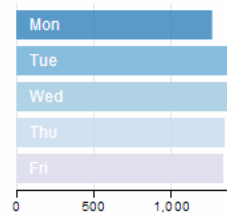


Bar chart

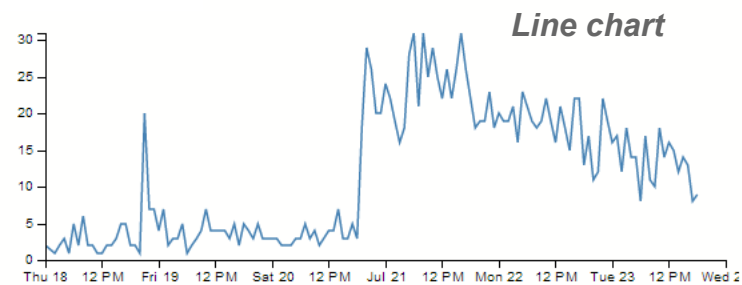


Pie chart

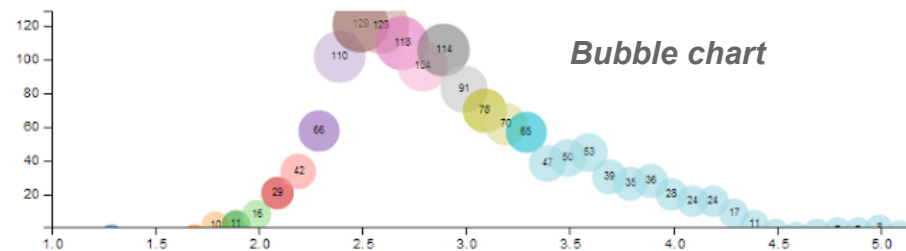
Day of Week



Row chart



Line chart

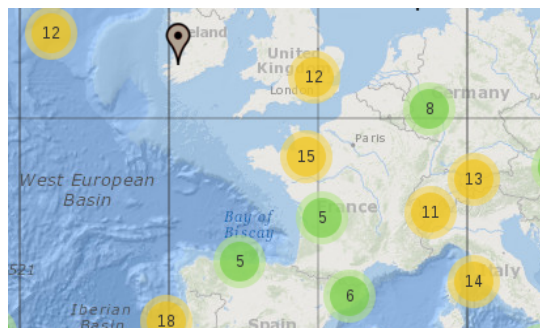
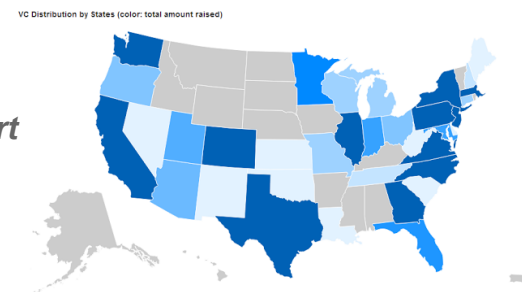


Bubble chart

DTG	Lat	Long	Depth	Magnitude	Google Map	OSM Map
List of all earthquakes corresponding to the filters						
Tue Jul 23 2013 17:50:01 GMT+1200 (New Zealand Standard Time)	-41.6244	174.3607	10	2.5	Google Map	OSM Map
Tue Jul 23 2013 18:01:08 GMT+1200 (New Zealand Standard Time)	-41.6327	174.2831	21	3.4	Google Map	OSM Map
Tue Jul 23 2013 18:05:20 GMT+1200 (New Zealand Standard Time)	-38.8079	175.4547	140	2.1	Google Map	OSM Map
Tue Jul 23 2013 18:11:13 GMT+1200 (New Zealand Standard Time)	-41.6919	174.3964	8	2.3	Google Map	OSM Map
Tue Jul 23 2013 18:16:41 GMT+1200 (New Zealand Standard Time)	-41.7113	174.1772	18	2.7	Google Map	OSM Map
Tue Jul 23 2013 18:23:04 GMT+1200 (New Zealand Standard Time)	-41.6946	174.0623	5	1.9	Google Map	OSM Map

Data table

Geo Choropleth chart



Leaflet clustering chart

Profils

dichotomy?

generalist x specialist



the
creative
developer

by @almirfilho

developer

web developer

front-end developer

ui developer

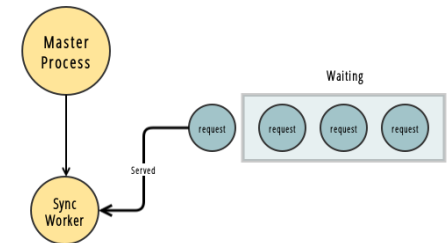
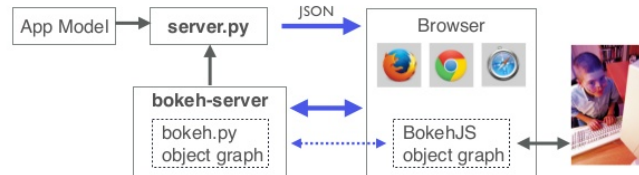
<http://www.slideshare.net/almirfilho/the-creative-developer>
Almir Filho, Web Developer

Différentes solutions pour le back-end



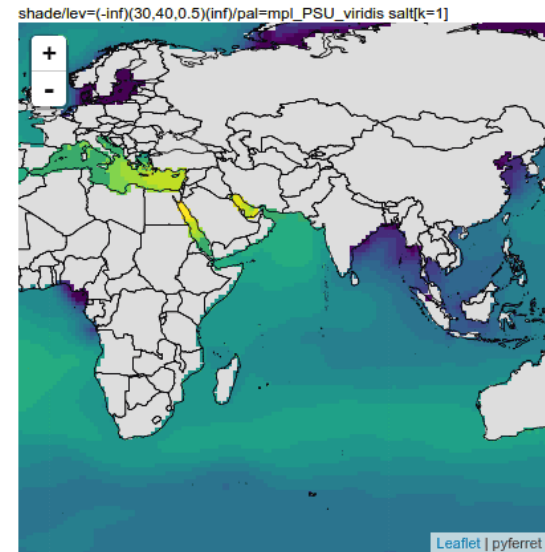
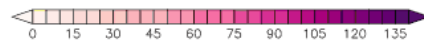
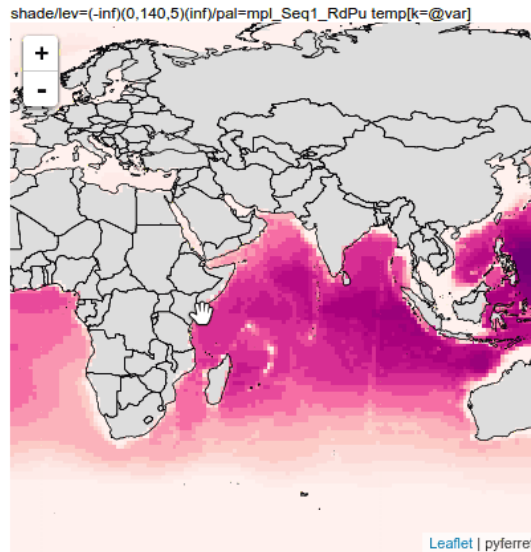
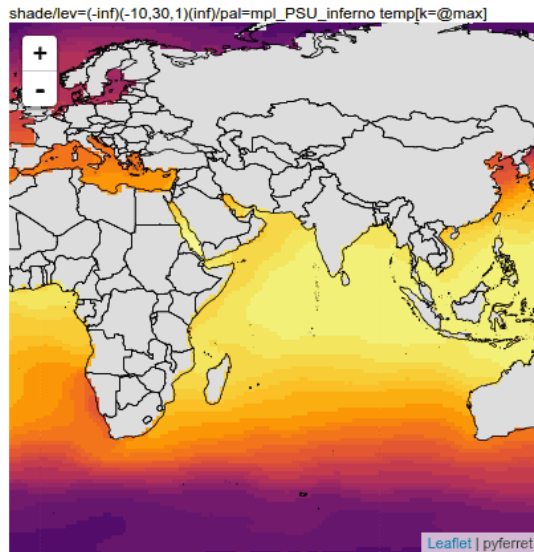
bokeh.py & bokeh.js

CONTINUUM
ANALYTICS



Slippy synchronous maps

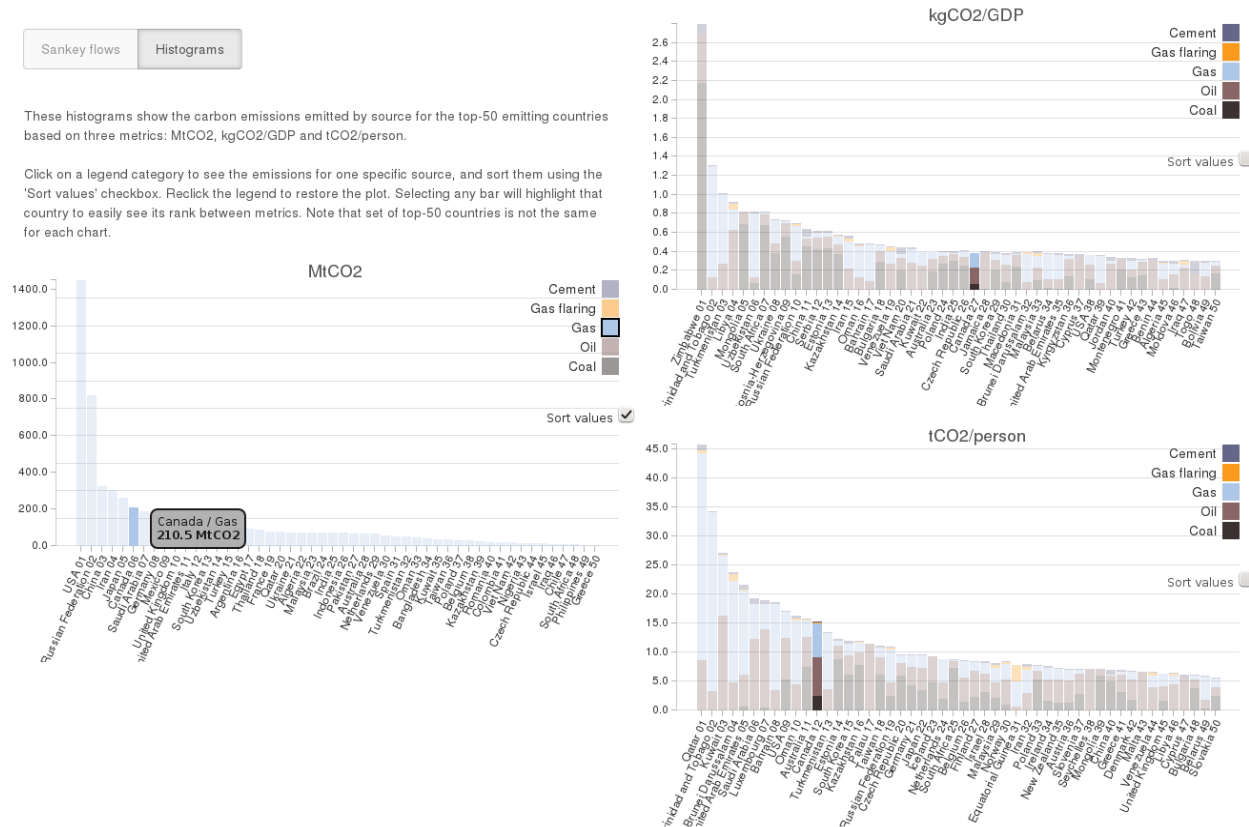
- gunicorn
- pyferret



<https://github.com/PBrockmann/wms-pyferret>

Data visualisation basée sur d3.js

- rendre interactif des graphiques statiques
- offrir un mode exploratoire



<http://lsce-datavisgroup.github.io/CO2emissions/>