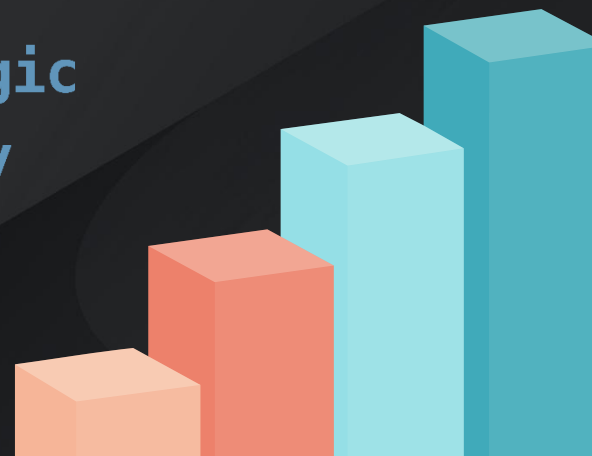
SC 3.7 EGU25

DataViz: Visualise your data effectively and avoid common pitfalls

Conveners:
Paola Mazzoglio (Politecnico di Torino, Italy)
Edoardo Martini (University of Leipzig, Germany)
Roshanak Tootoonchi (University of Trento, Italy)
Epari Ritesh Patro (University of Oulu, Finland)
Xinyang Fan (University of Erlangen-Nuremberg, Germany)

Invited speaker:
Fabio Crameri (Undertone.design & ISSI Bern, Switzerland)

Young Hydrologic Society



THE YHS

The YHS

The Young Hydrologic Society (YHS) is a bottom-up initiative to stimulate the interaction and participation of young hydrologists within the hydrological community.

Founded in October 2012, the YHS is currently run by a team of early career scientists from several universities across the world.

The YHS

The Young Hydrologic Society is divided into several committees.

The **Conference Committee** is involved in organizing meetings and activities before and during the main conferences in the field of hydrology, like the EGU, the AGU, or the conferences of the International Association of Hydrological Sciences (IAHS).

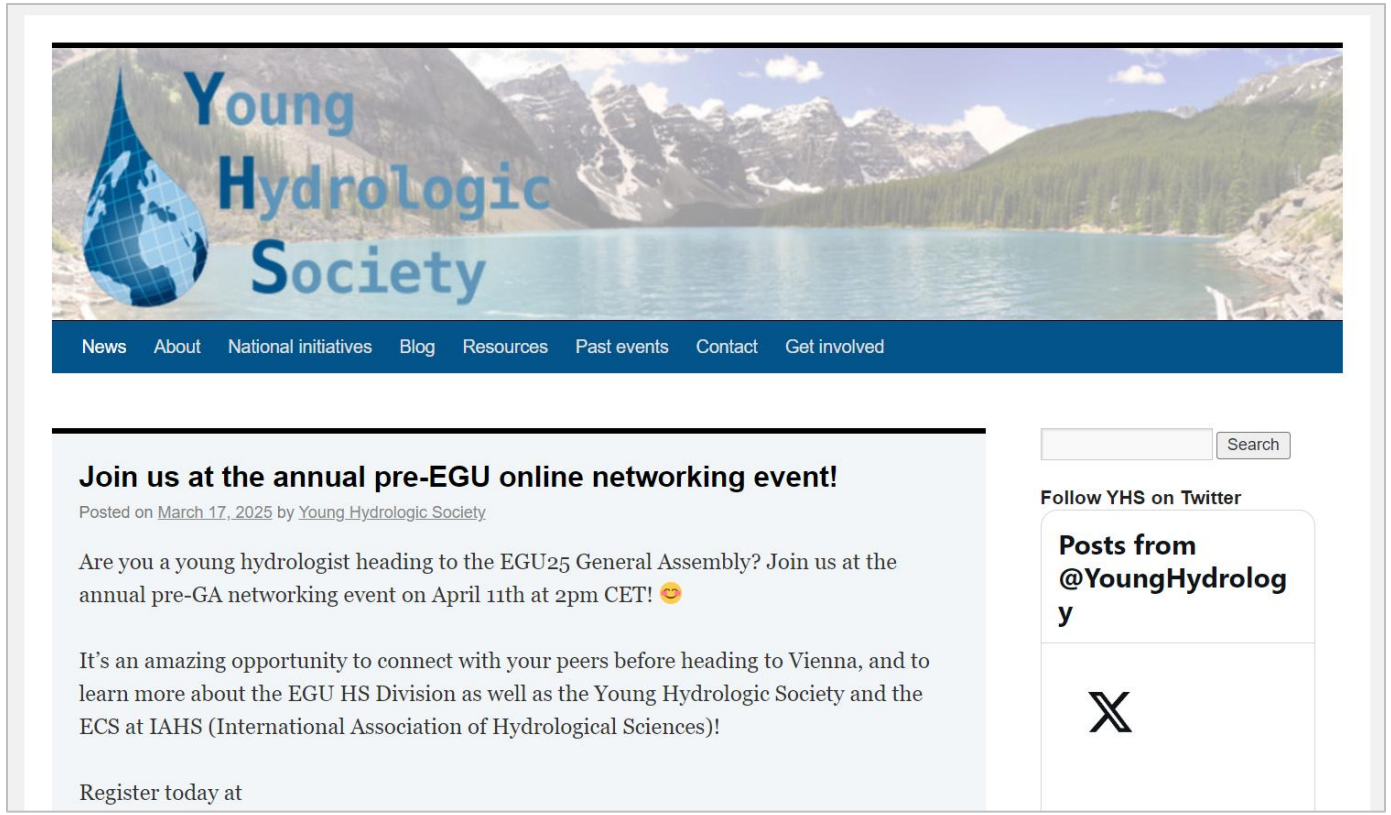
The **Blog Committee** manages the website of the YHS and its blog post series. We also publish posts related to upcoming events and we also collect and publish all the materials presented during the Short Courses delivered by members of the YHS during EGU.

The **National Branches Committee** is a group of people that help in the creation of national sections of the YHS. Each section is almost independent, but we support them with some guidelines or by advertising the activities online.

The **Outreach Committee** manages the social networks of the group, mainly LinkedIn and Bluesky.

The YHS

For more info, please visit our website, https://younghs.com



We are on LinkedIn, BlueSky and X (the profile is active, but we are not posting).

https://www.linkedin.com/in/young-hydrologic-society-20353960/

@younghydrology.bsky.social

@YoungHydrology
@YHS_jobs

TODAY’S MENU

The Course structure

Brief history of DataViz

DataViz: how to

- Interactive block 1

Colour schemes

- Interactive block 2

Climate Data Operators (CDO)

Panoply

AI tools for DataViz

Publication compliance

- Interactive block 3

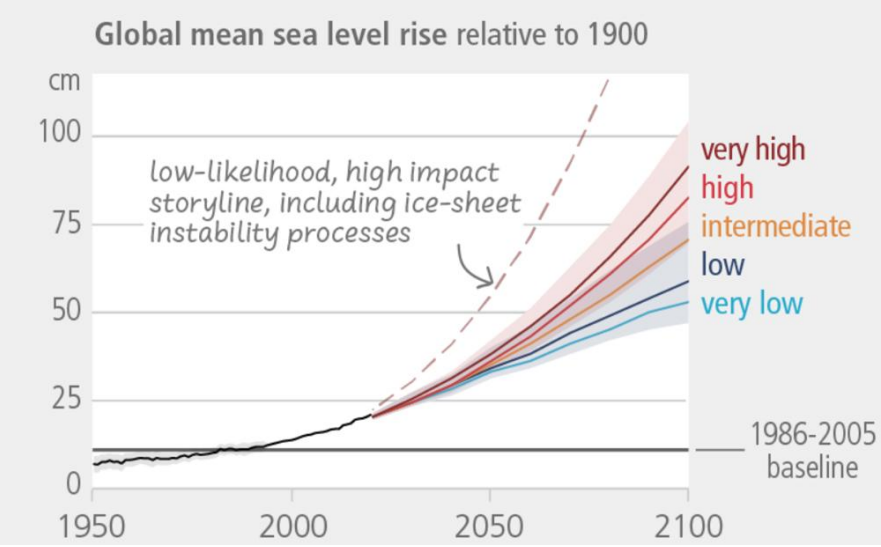
Additional resourses

Q&A

What is DataViz?

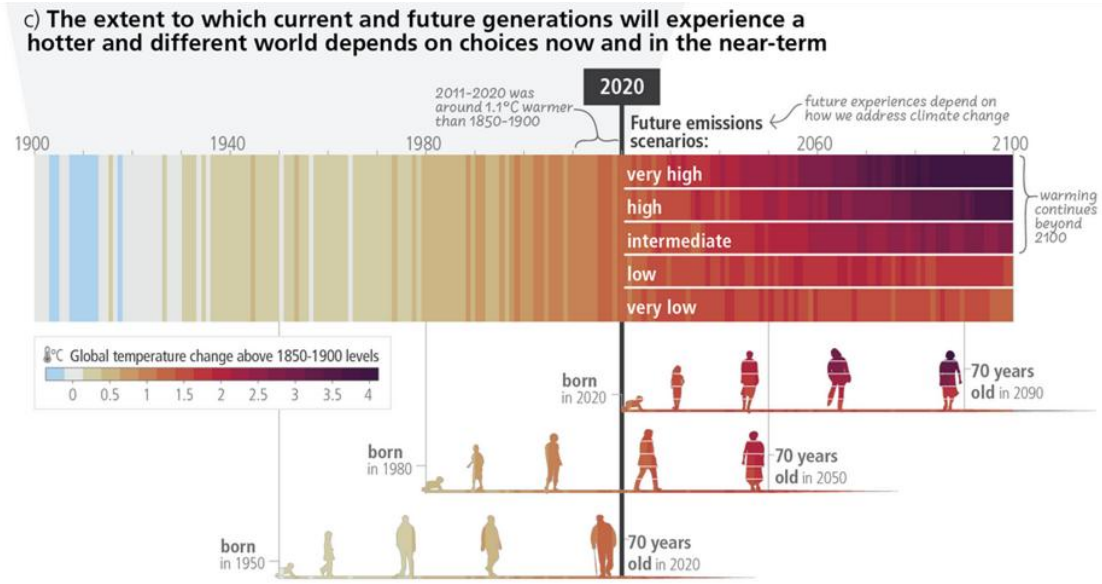
“DataViz” = Data Visualization

Graphical representation of scientific data in a clear and concise way, performed to **make data easier to understand and analyze**, reveal patterns, trends, and relationships within the data, aiding in decision-making and storytelling.



“InfViz” = Information Visualization (also known as Information Design)

Graphical representation of scientific concepts in a way that is easy to understand and use, by structuring information, selecting appropriate visuals, and considering the user's perspective. The purpose is communicating complex information clearly, efficiently, and effectively.



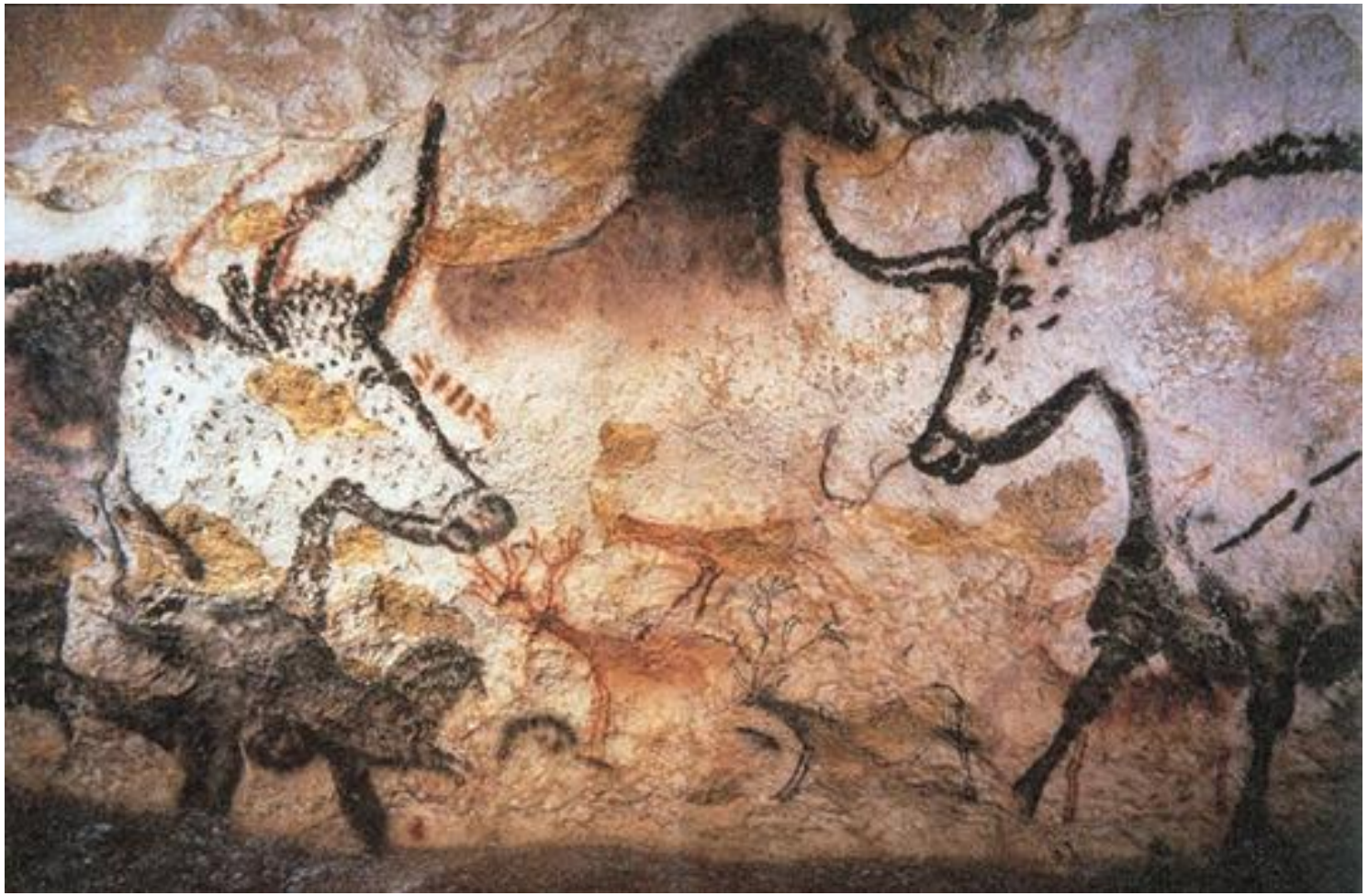
Source: IPCC AR6 Synthesis Report, Climate Change 2023

BRIEF HISTORY OF DATAVIZ

Brief history of DataViz

DataViz is not a new field…

Cave paintings in the Lascaux cave (France) of the Upper Paleolithic (50,000 – 12,000 years ago).



Source: https://en.wikipedia.org/wiki/Lascaux#/media/File:Lascaux_painting.jpg

Brief history of DataViz

DataViz is not a new field…

Source: https://en.wikipedia.org/wiki/Lascaux#/media/File:Lascaux_painting.jpg

The **Babylonian Map of the World** (also known as Imago Mundi or Mappa mundi) is a Babylonian clay tablet with a schematic world map (of the world known at that time).

Dated to no earlier than the 9th century BC (with a late 8th or 7th century BC date being more likely), it includes a brief and partially lost textual description.

Brief history of DataViz

DataViz is not a new field…

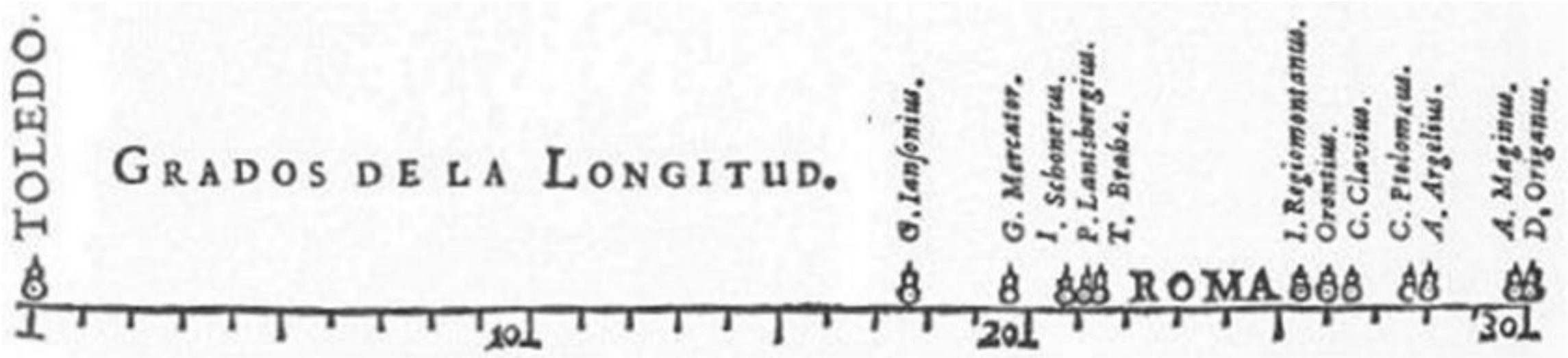
Typus Orbis Terrarum, the first world map created by Abraham Ortelius (1570).

Source: https://en.wikipedia.org/wiki/Abraham_Ortelius#/media/File:Theatrum_Orbis_Terrarum,_by_Abraham_Ortelius,_World,_1572.jpg

Brief history of DataViz

DataViz is not a new field…

Michael Florent van Langren (1644). **First graphical representation of statistical data**: longitudinal distances from Toledo (Spain) to Rome (Italy).

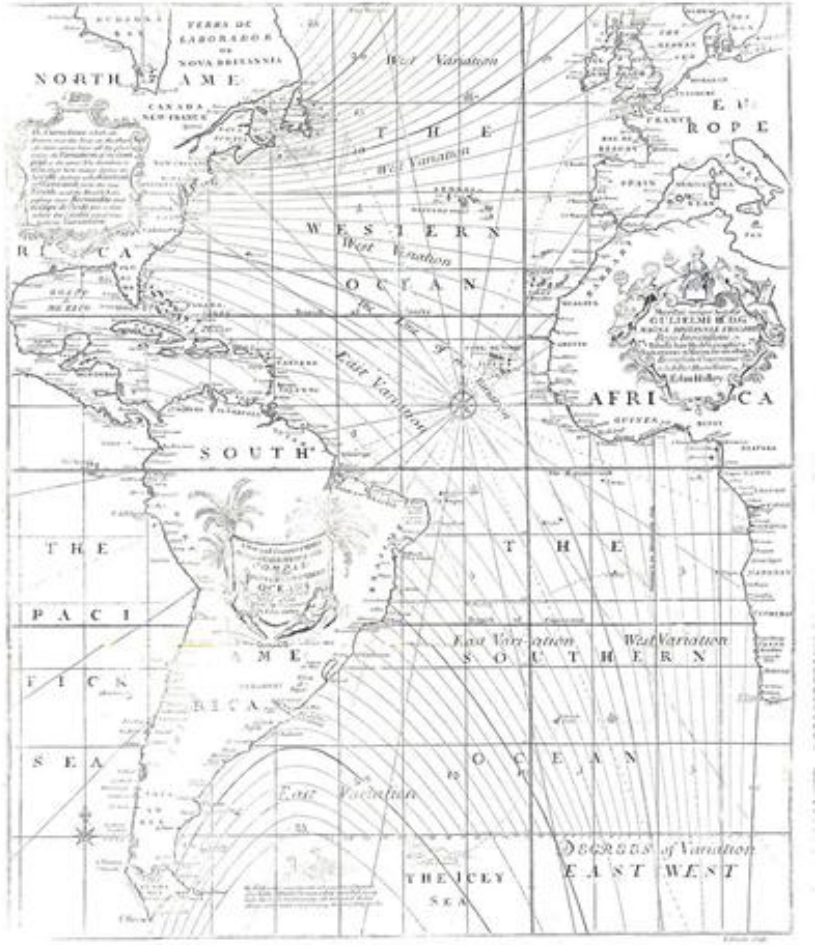


Source: https://en.wikipedia.org/wiki/Michael_van_Langren#/media/File:Grados_de_la_Longitud.jpg

Brief history of DataViz

DataViz is not a new field…

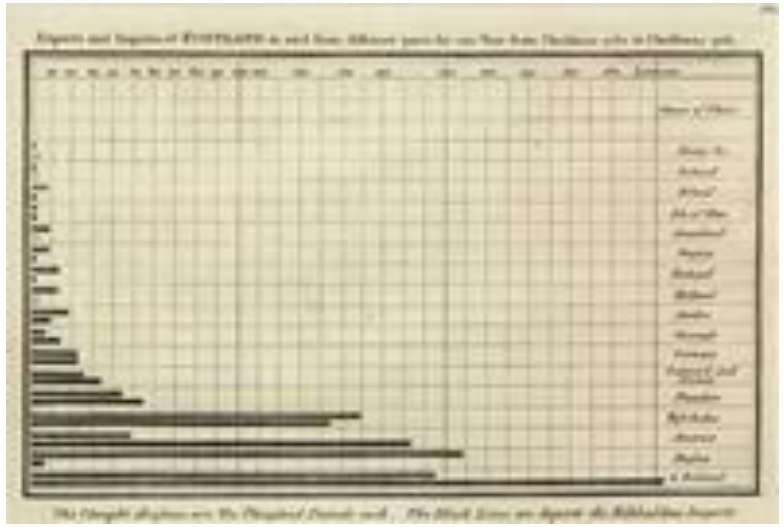
Edmond Halley (1701). **The first known isolines.**



Source: https://en.wikipedia.org/wiki/Edmond_Halley#/media/File:Halley_isogonic_1701.jpg

Brief history of DataViz

DataViz is not a new field…



William Playfair (1759 – 1823, United Kingdom) was the founder of graphical methods of statistics.

He invented several types of diagrams: he introduced the line, area and bar chart of economic data, and later he published what were likely the first pie chart and circle graph, used to show part-whole relations.

Source: https://en.wikipedia.org/wiki/William_Playfair

Brief history of DataViz

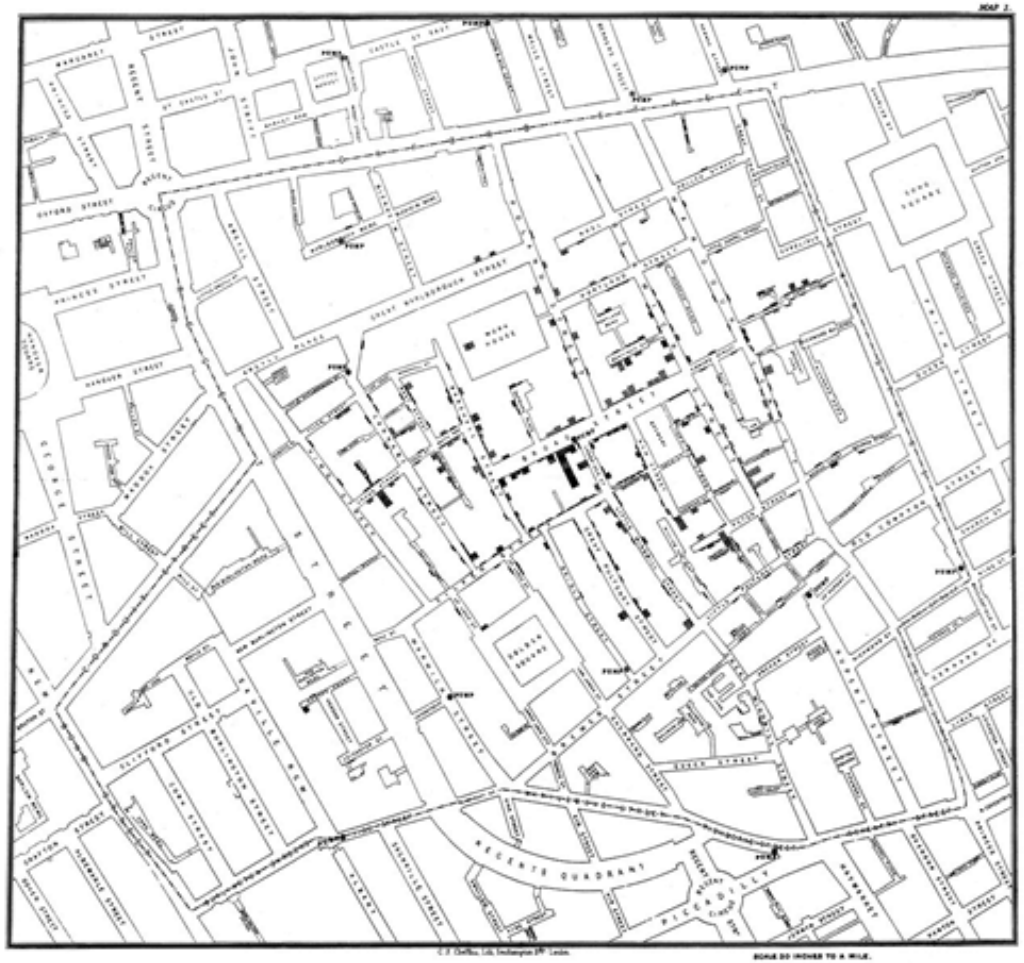
DataViz is not a new field…

John Snow, 1854, England.

The map was created to better understand the pattern of **cholera spread** in the 1854 London cholera outbreak.

Cholera cases are highlighted in black, showing the clusters of cholera cases. Snow used it to understand how cholera spread through water systems.

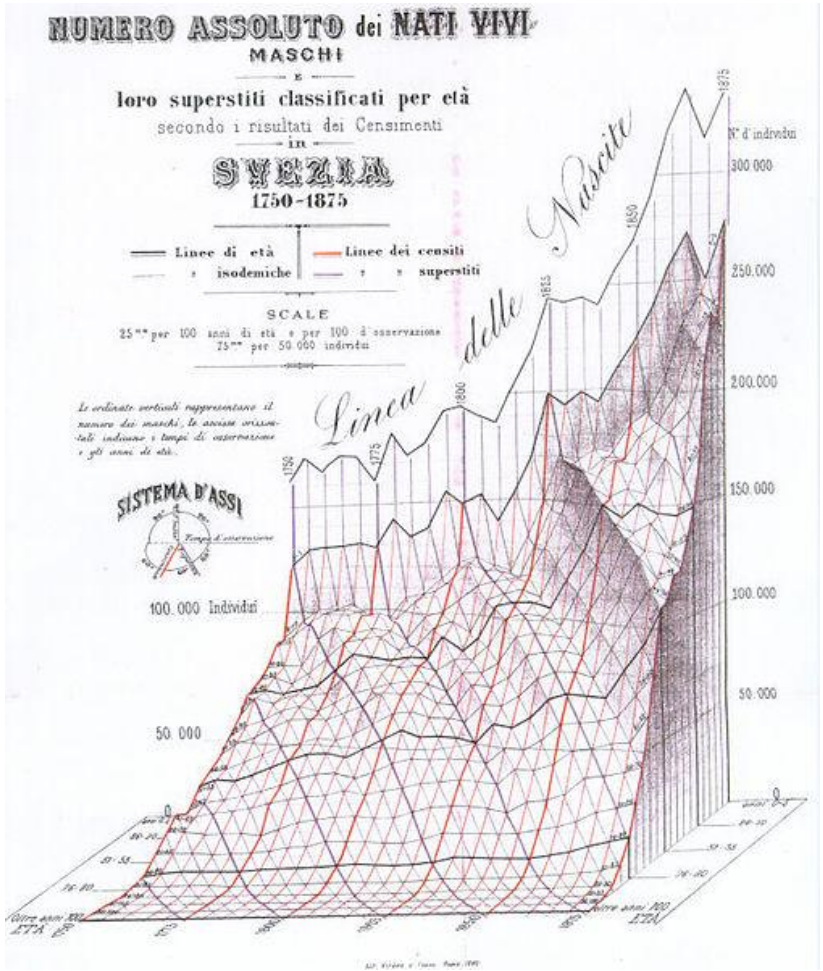
The map marks an important part of the development of epidemiology as a field, and of disease mapping as a whole.



Source: https://en.wikipedia.org/wiki/John_Snow#/media/File:Snow-cholera-map-1.jpg

Brief history of DataViz

DataViz is not a new field…



Luigi Perozzo (1856 - 1916, Italy).
Population pyramid: **the first known 3D visualization**.

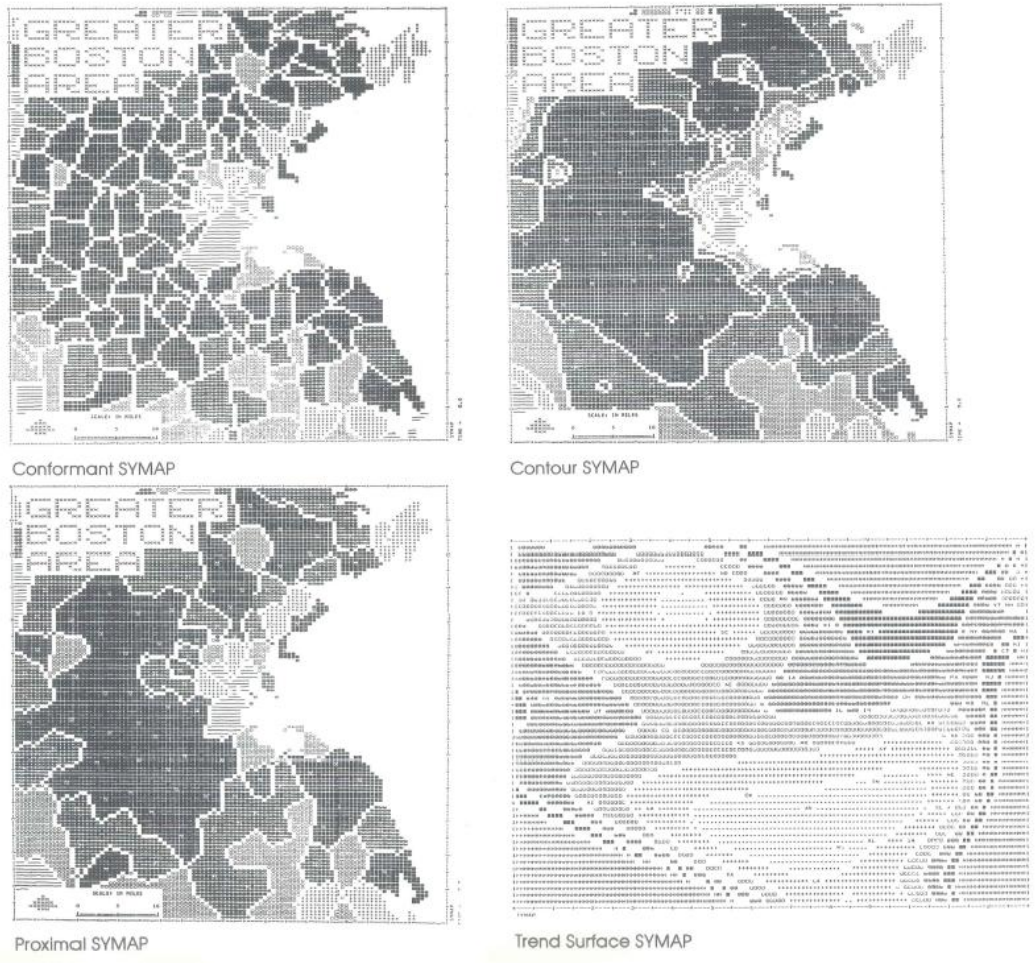
Source: https://it.m.wikipedia.org/wiki/File:Stereogram_(three-dimensional_population_pyramid)_modeled_on_actual_data_(Swedish_census,_1750-1875).jpg

Brief history of DataViz

DataViz is not a new field…

Harvard Laboratory for Computer Graphics and Spatial Analysis (1965 to 1991) pioneered early cartographic and architectural computer applications that led to integrated geographic information systems (GIS).

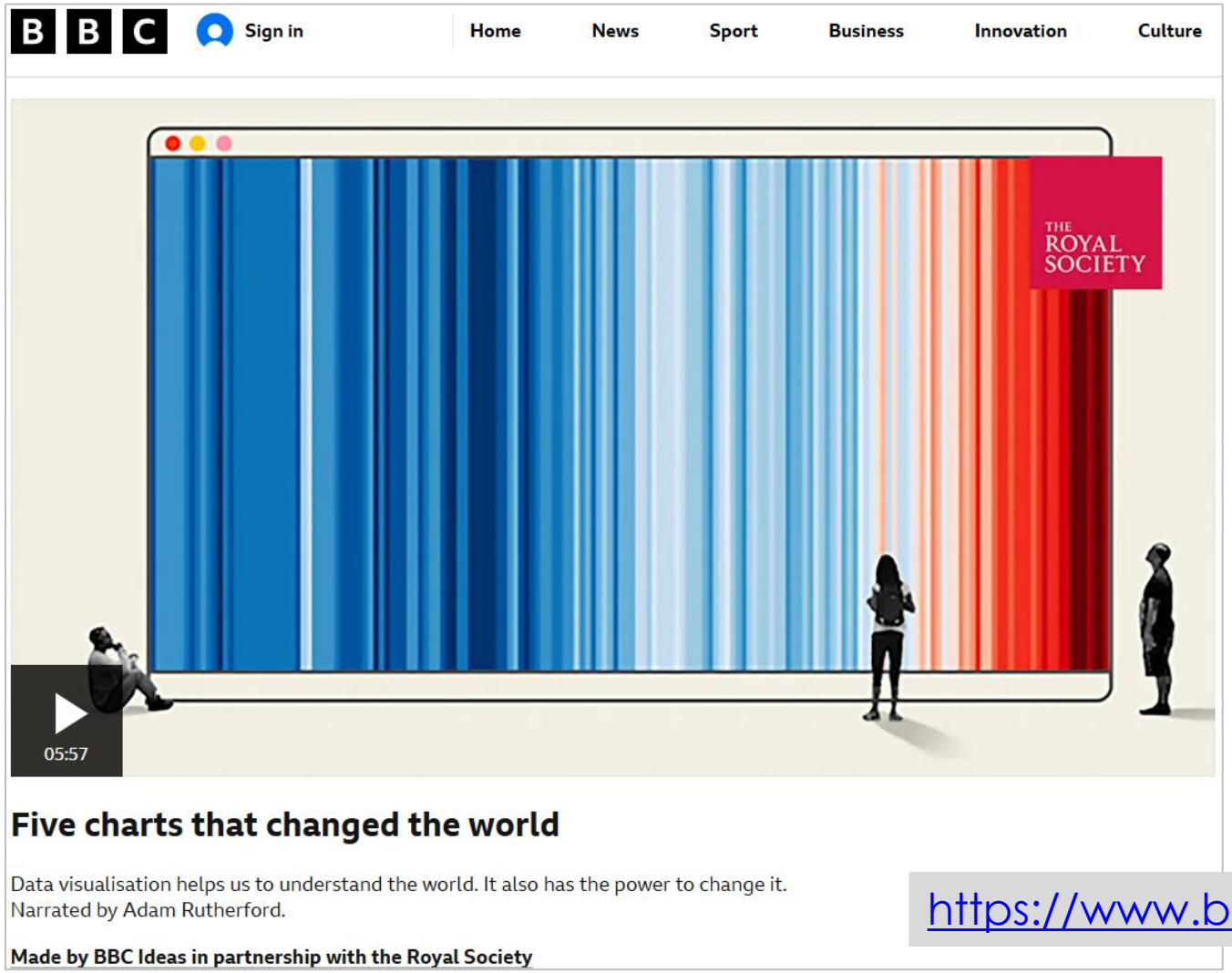
Computer software for the analysis and graphic display of spatial data: first (low cost) printed output.



Sources: https://en.wikipedia.org/wiki/Harvard_Laboratory_for_Computer_Graphics_and_Spatial_Analysis#/media/File:SYMAP_-_LAB-LOG_1980.png

Brief history of DataViz

If you want to know more about DataViz…



https://www.bbc.com/videos/cl4ypxnprp0o

DATAVIZ: HOW TO

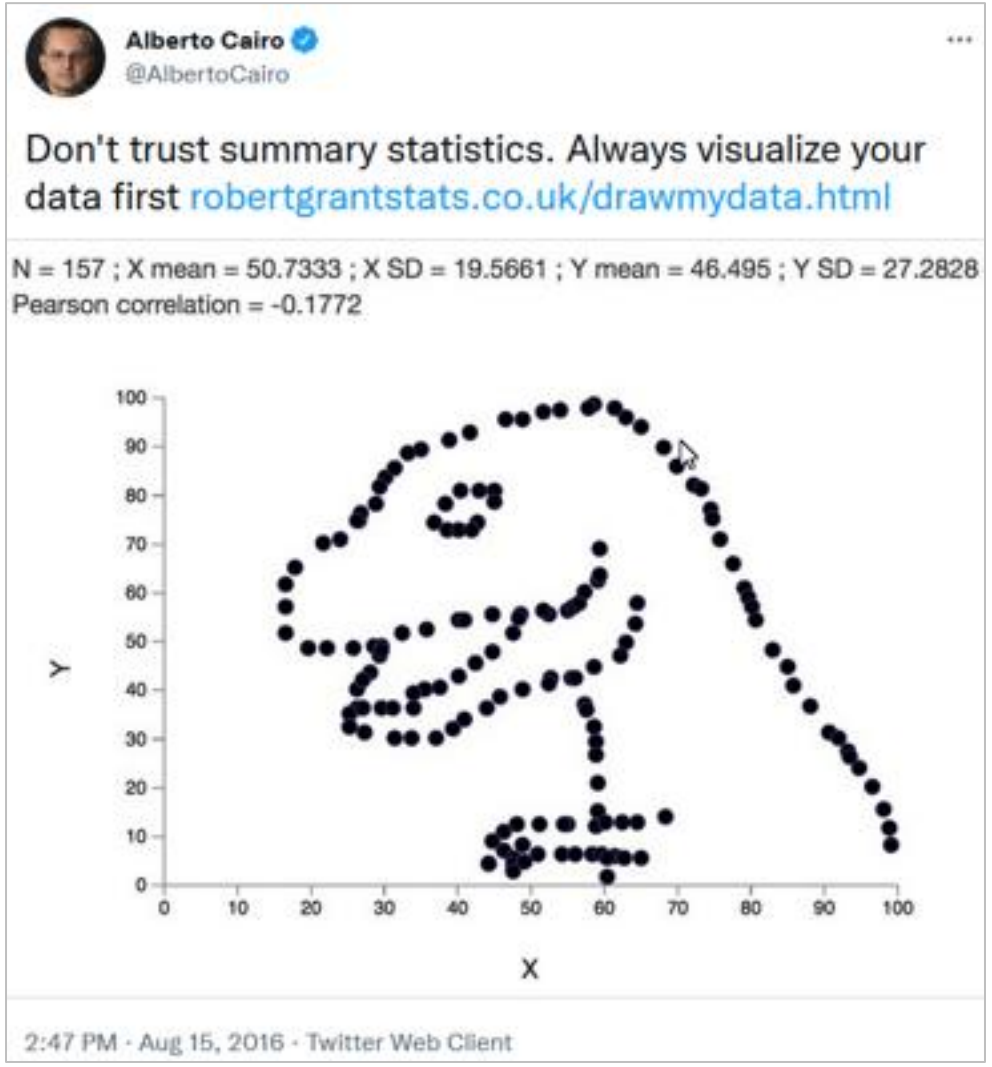
Why DataViz?

Visualizing data helps us to **comprehend huge amounts of information** by compressing them into a simple and clear visualization.

We use DataViz to **communicate data to the audience**.

It helps us to find hidden patterns or see underlying problems in the data itself which might not have been obvious without a good chart.

The human brain processes information **better** and **quickly** when it is presented visually.



How to DataViz

Good DataViz:

- Correct
- Effective
- Accessible

Bad DataViz:

- Misrepresent the data
- Use inappropriate data
- Too much or too less information
- Inconsistent
- Ignore limits of human perception

How to DataViz

Before you DataViz, think:

- **Purpose** *Why am I making this visualization?*
- **Audience** *Who am I making it for?*
- **Medium** *How will I use and share it?*
- **Tools** *What can I use to make it?*
- **Message** *What story does it tell?*
- **Critical approach** *Who does it affect? Who is left out?*

Choosing the right plot type

Useful resources for selecting the most appropriate chart:

- data-to-viz.com
- datavizcatalogue.com
- datavizproject.com

Graphical elements of a plot

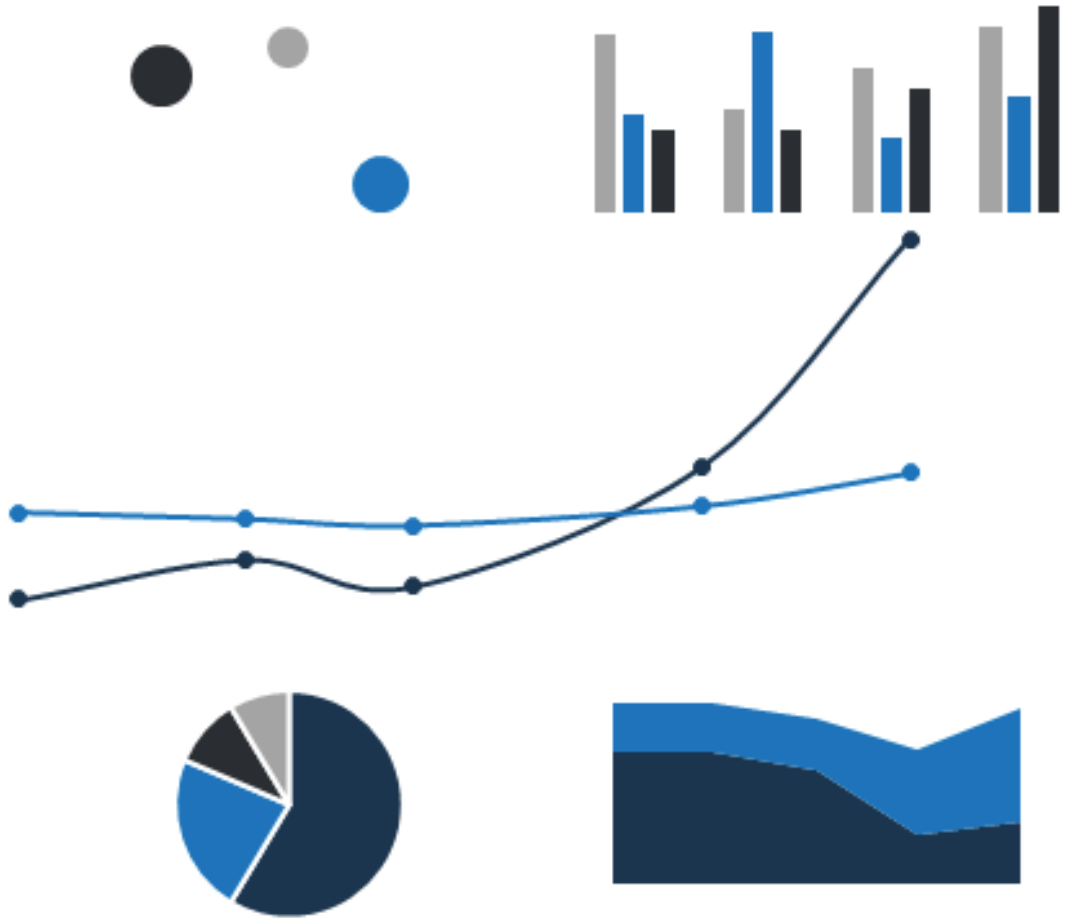
Marks and their **attributes** are the building blocks of all data visualizations.

Marks:

- Points
- Lines
- Areas
- Volumes

Attributes:

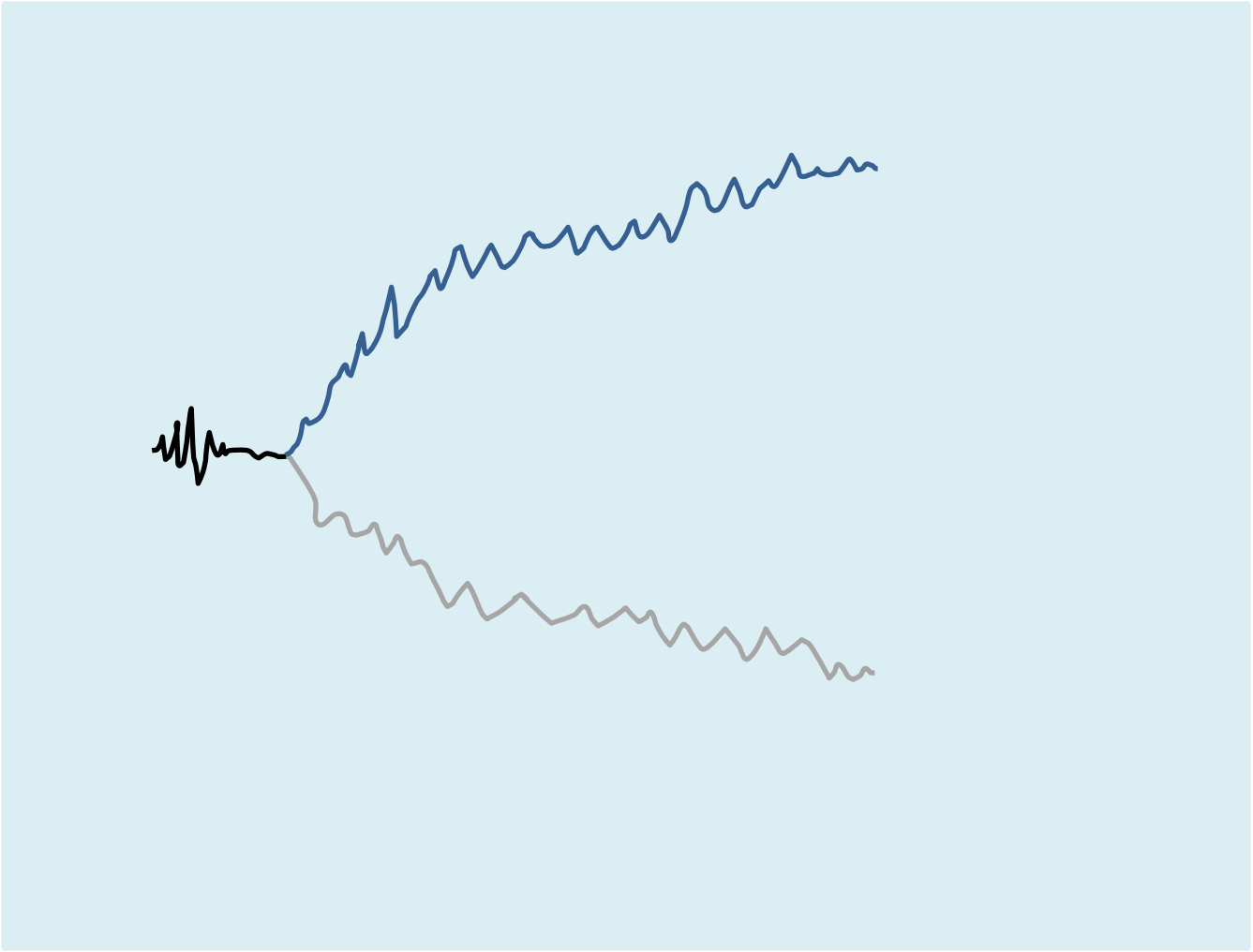
- Size
- Shape
- Orientation
- Colour



Graphical elements of a plot

Marks and their **attributes** are the building blocks of all data visualizations.

Alone, they are not sufficient to convey the message!



Graphical elements of a plot

Marks and their **attributes** are the building blocks of all data visualizations.

Alone, they are not sufficient to convey the message!

We should also insert:

- Axis
- Axis label(s)
- Axis title(s)
- Grid lines and ticks
- Title
- Caption
- Data labels
- Layout (blank spaces)

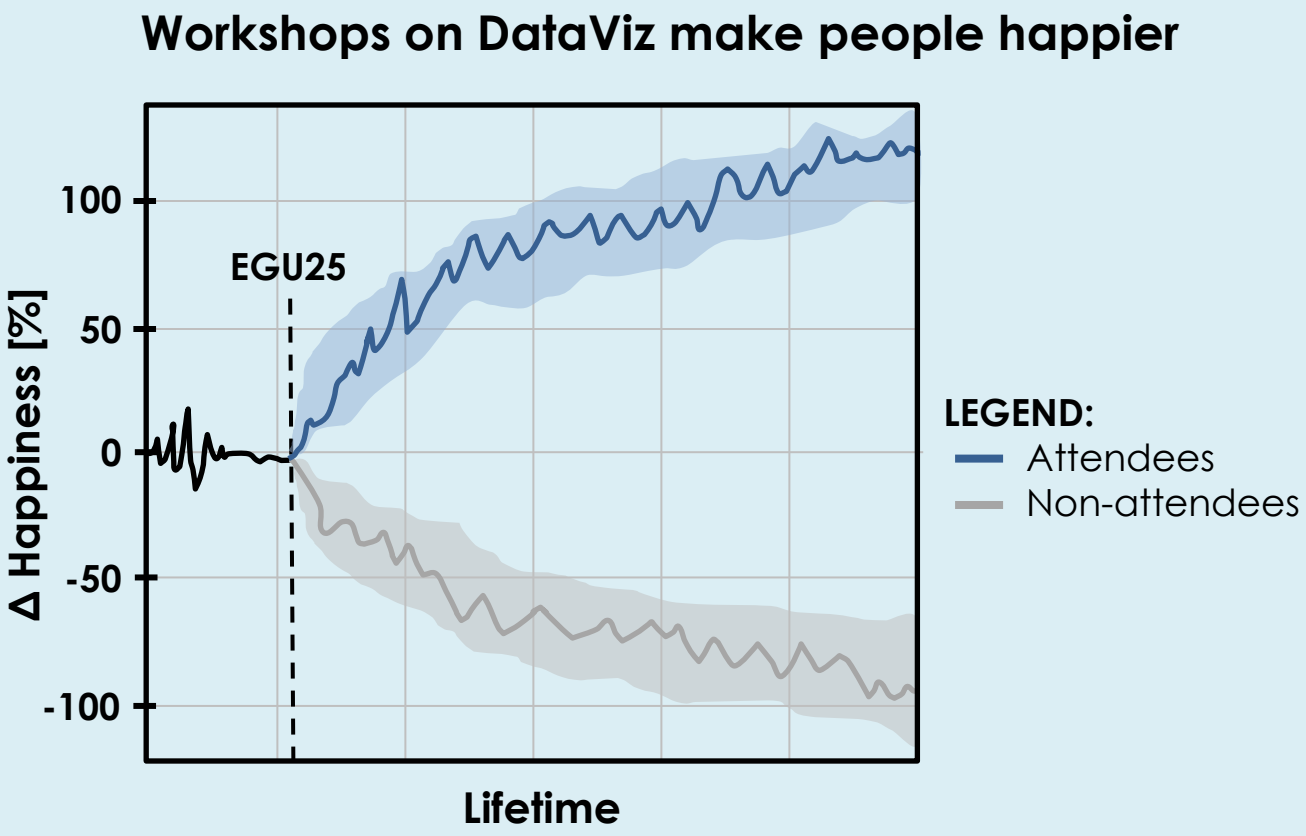


FIGURE 1: predicted happiness for the two categories analysed in this study (i.e., attendees and non-attendees of the EGU25 Short Course 3.7 «DataViz»).

Choose the right font type

Sans Serif

this is the “serif”

Sans-Serif font types are:

- more clean
- less formal
- less affected by poor resolution
- better readable?

Font size:
at least 9p on paper,
18p on screen

Choose the right font type

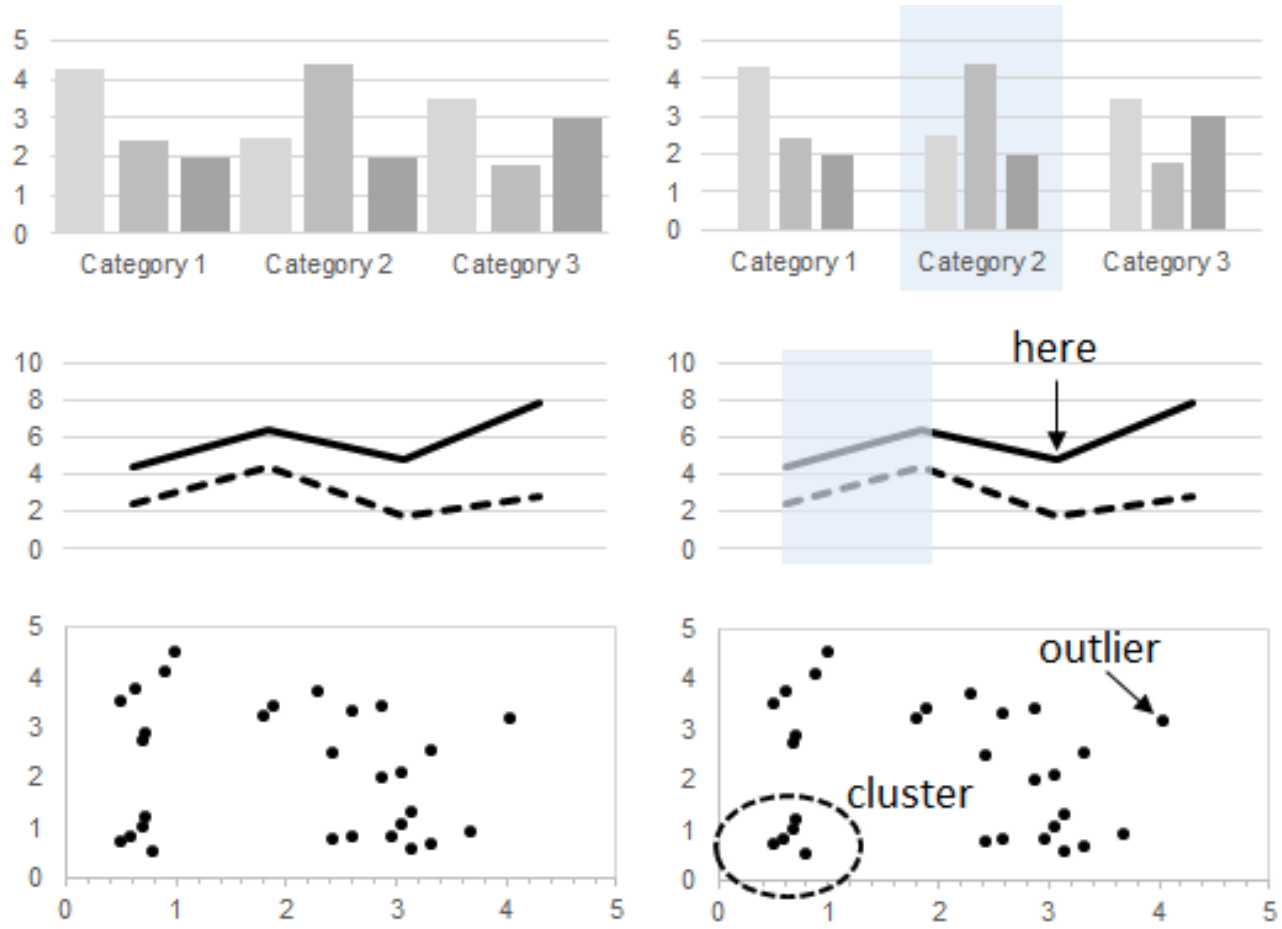
Choose the right font type	Arial
Choose the right font type	Calibri
Choose the right font type	Verdana

Choose the right font type	Times New Roman
Choose the right font type	Georgia
Choose the right font type	Courier New
Choose the right font type	Comic Sans

Layout (single graph)

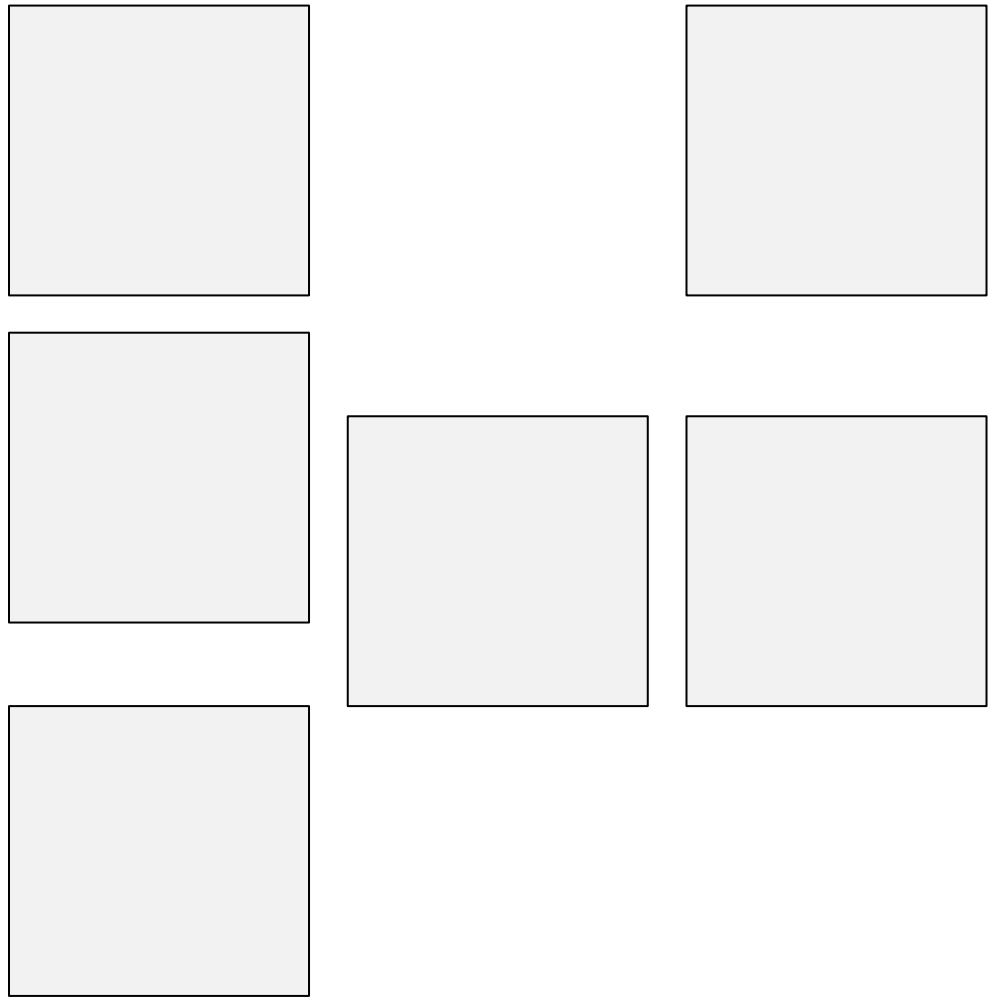
Individual chart elements (including the spatial arrangement) work together to reinforce a unified takeaway message.

Use layout and annotation to highlight and guide the reader.



Layout (multiple graphs)

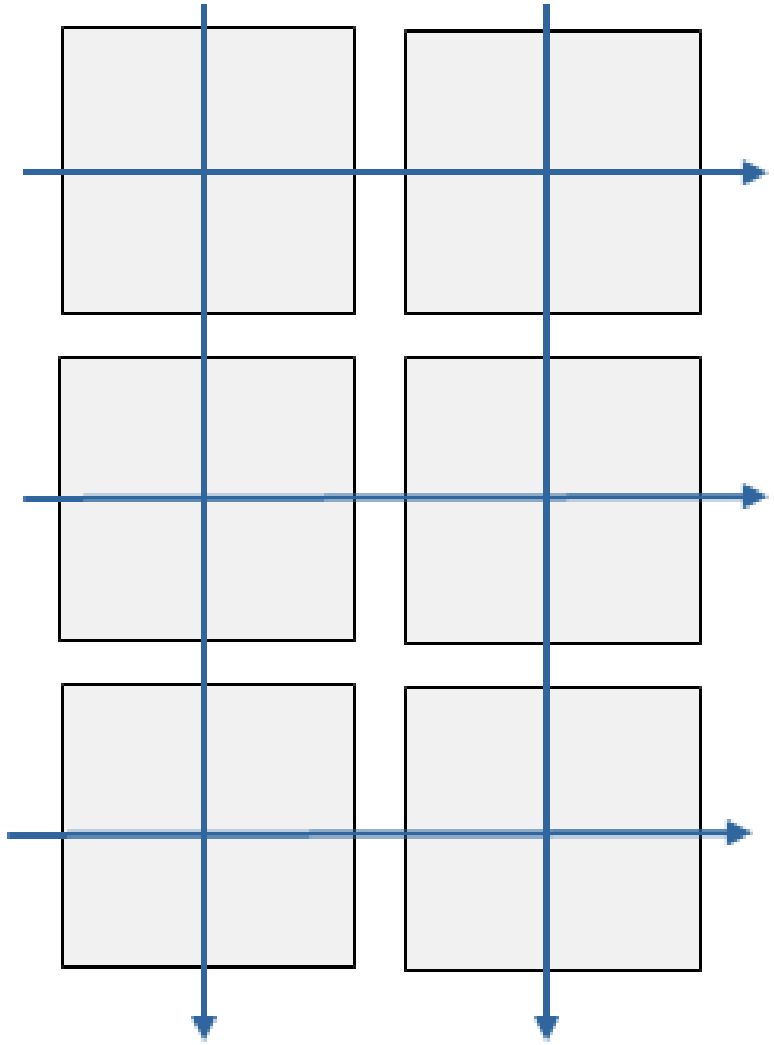
Improper arrangement of graph elements can confuse and/or mislead the readers.



Layout (multiple graphs)

Improper arrangement of graph elements can confuse and/or mislead the readers.

Make it intuitive to the reader!

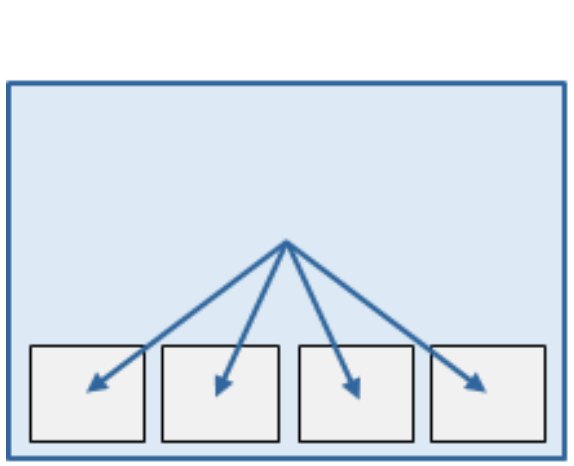


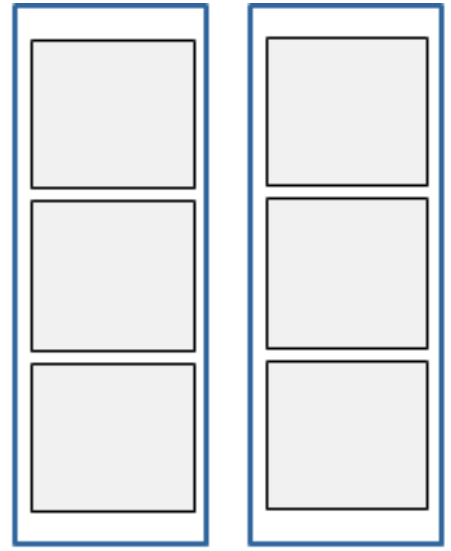
Layout (multiple graphs)

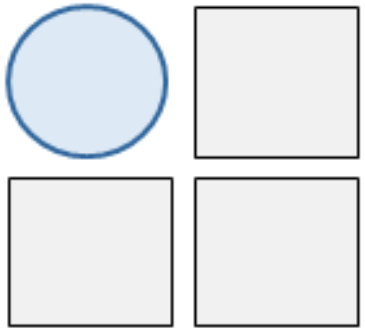
Improper arrangement of graph elements can confuse and/or mislead the readers.

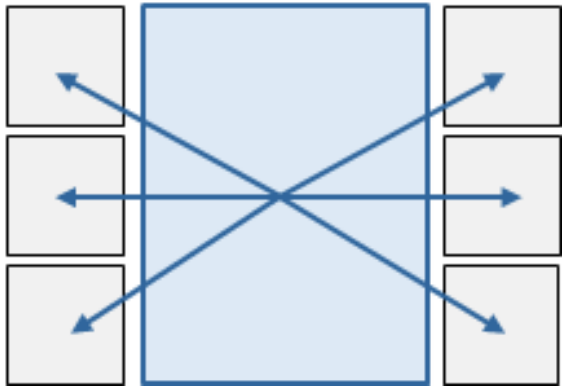
Make it intuitive to the reader!

Use layout to set priorities!









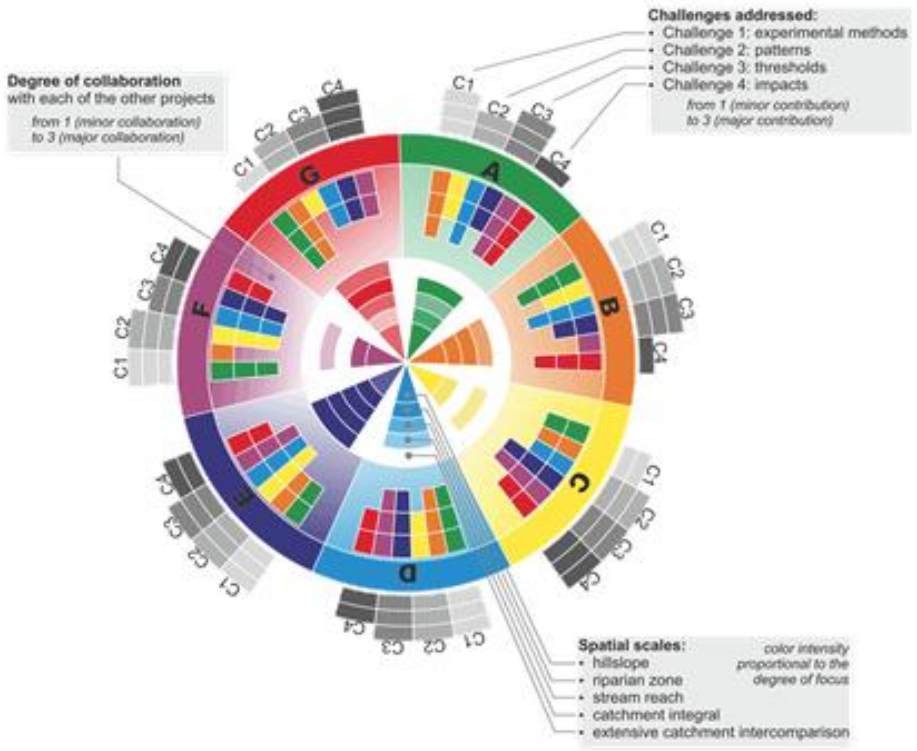
Simplicity vs creativity

Keep it simple!

- Do not overload.
- Aim to one clear message vs many.
- “Must have” vs “nice to have”.

Or help the reader navigate the graph!

- Split the content into n figures or sub-figures.
- Create a hierarchy/sequence (group, highlight, annotate, ...).



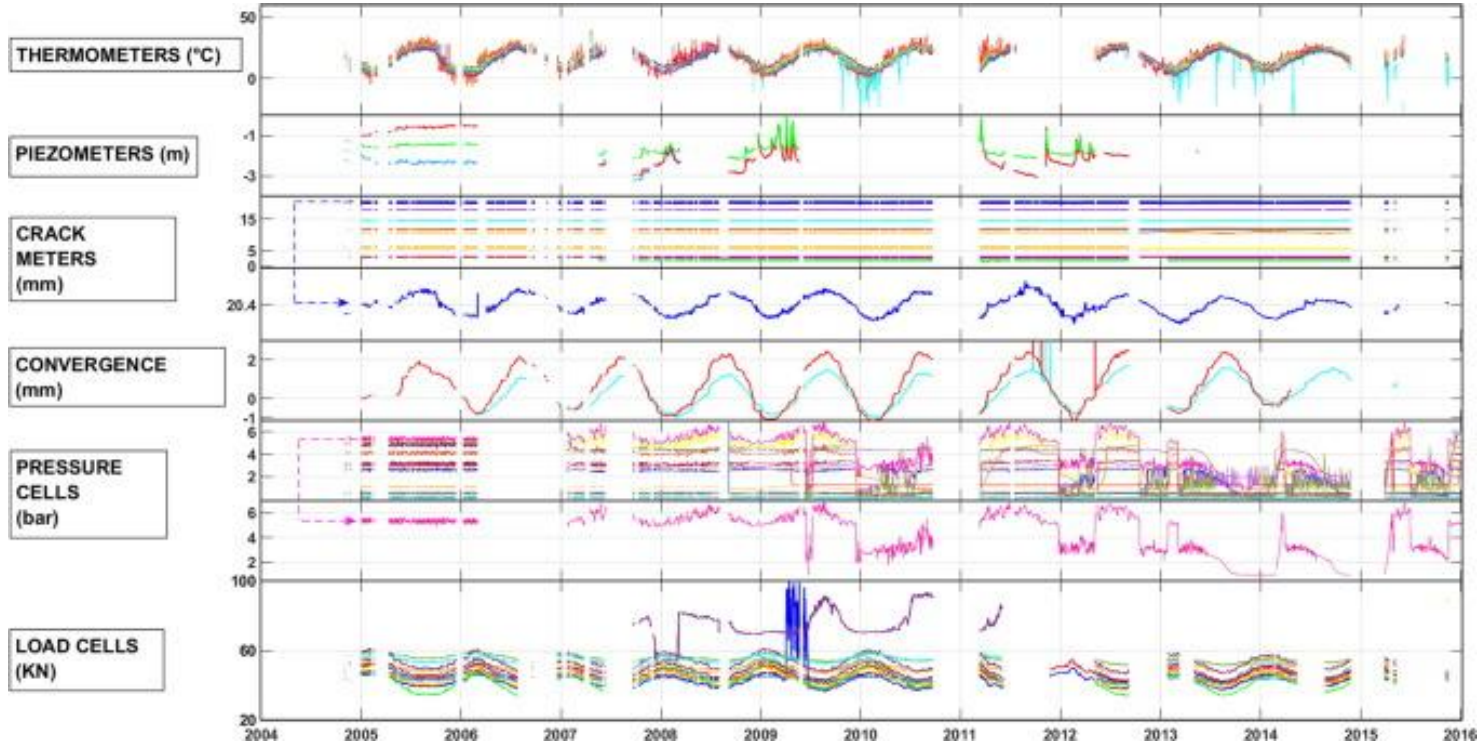
INTERACTIVE BLOCK 1

Raise your hand
if you agree with the statements/question.

Example 1

What's your thoughts?

- Information content is overloaded.
- Legend needed.



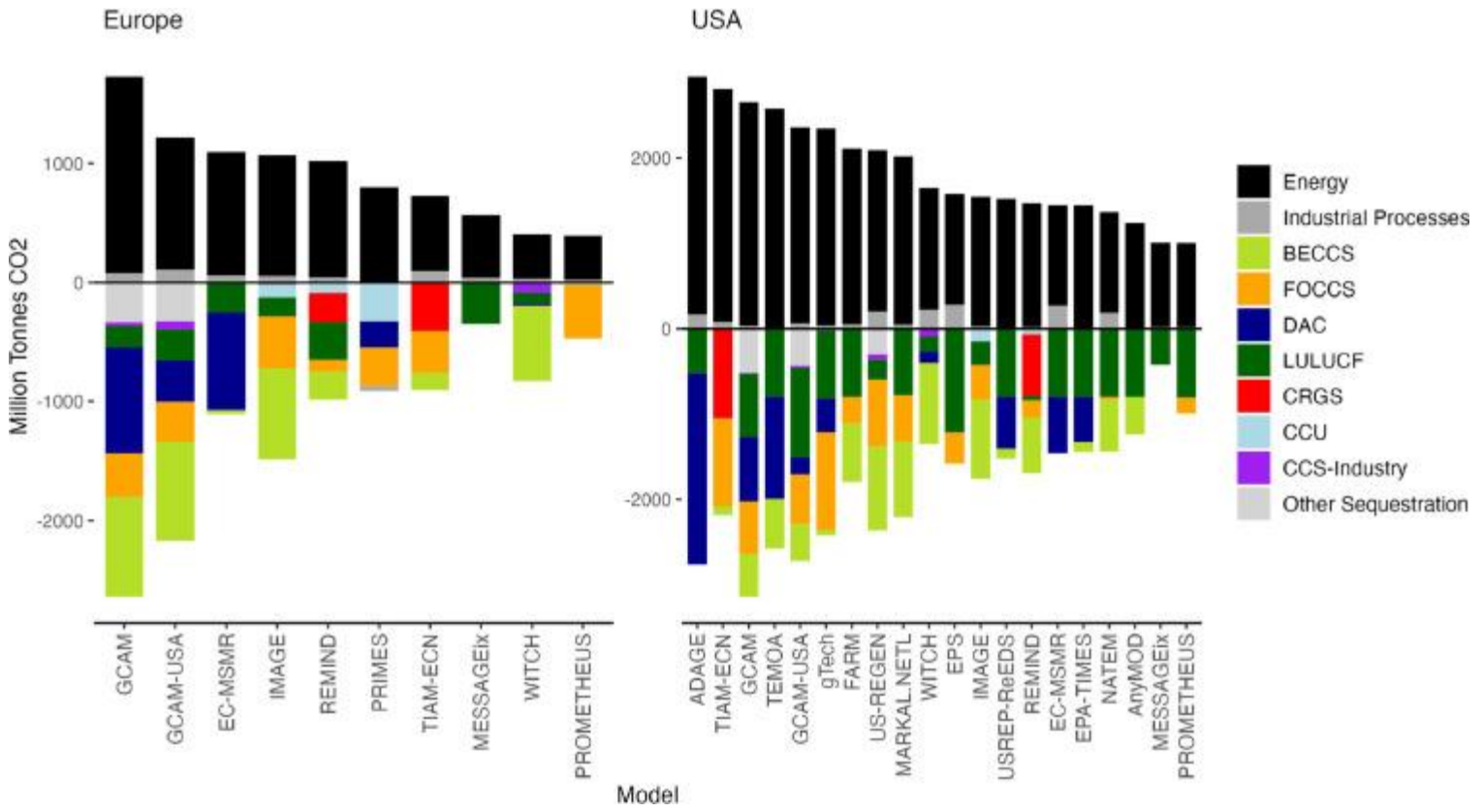
Ceravolo et al., 2021, YMSSP (https://doi.org/10.1016/j.ymssp.2020.107460)

Fig. 7. Static monitoring system. From the top to the bottom: thermometers, piezometers, crack meters (all and a selected time series), convergence, pressure cells (all and a selected time series), load cells.

Example 2

What's your thoughts???

- The chart type is correct.
- The legend is self-explanatory.
- Axis labels are self-explanatory.



Sarmiento et al., 2024, (https://doi.org/10.1016/j.egycc.2024.100144)

Fig. 5. Net Zero Difference in Sources of Emissions and Sequestration for Participating Models (2050).

COLOUR SCHEMES

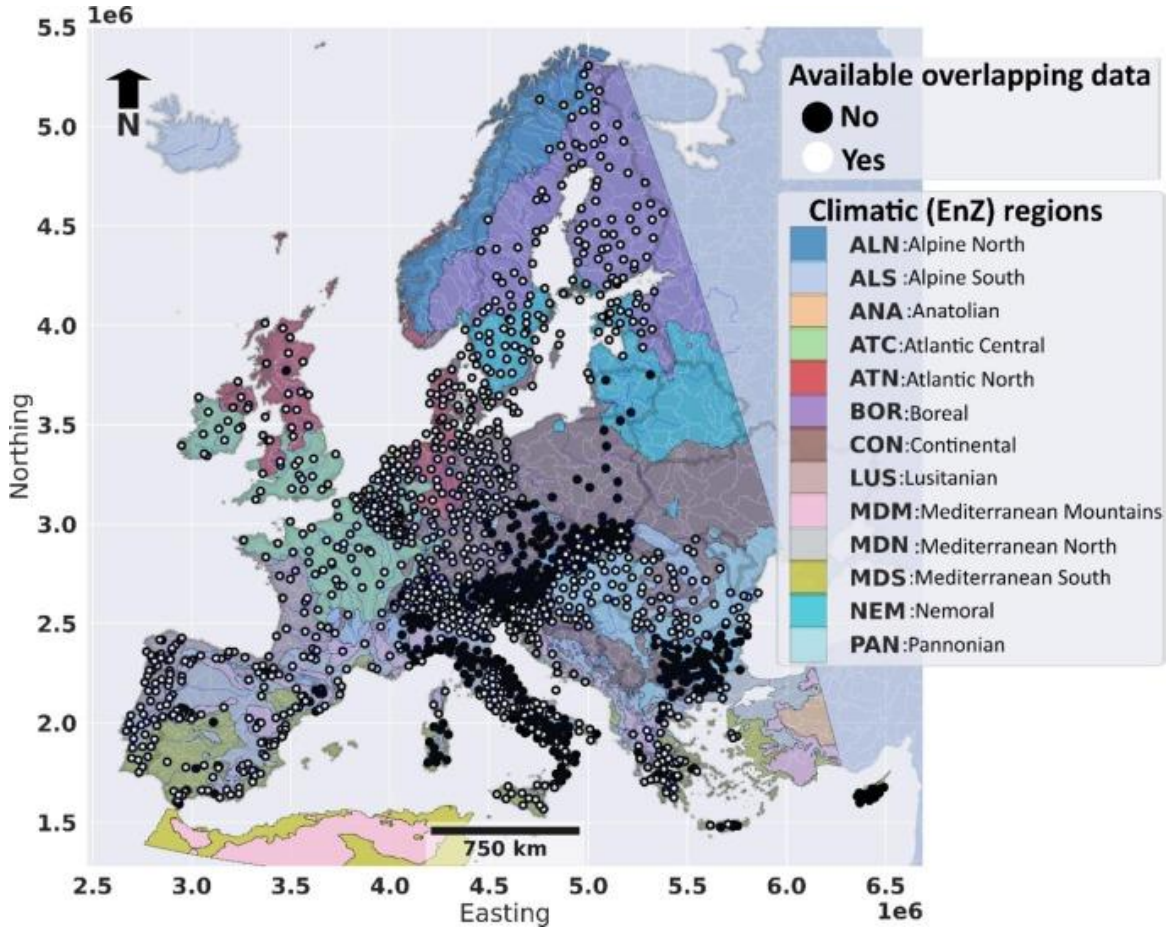
INTERACTIVE BLOCK 2

Raise your hand
if you agree with the statements/question.

Example 3

What's your thoughts???

- Able to skim the information.
- Strategic use of colour and opacity.
- Legend self-explanatory.



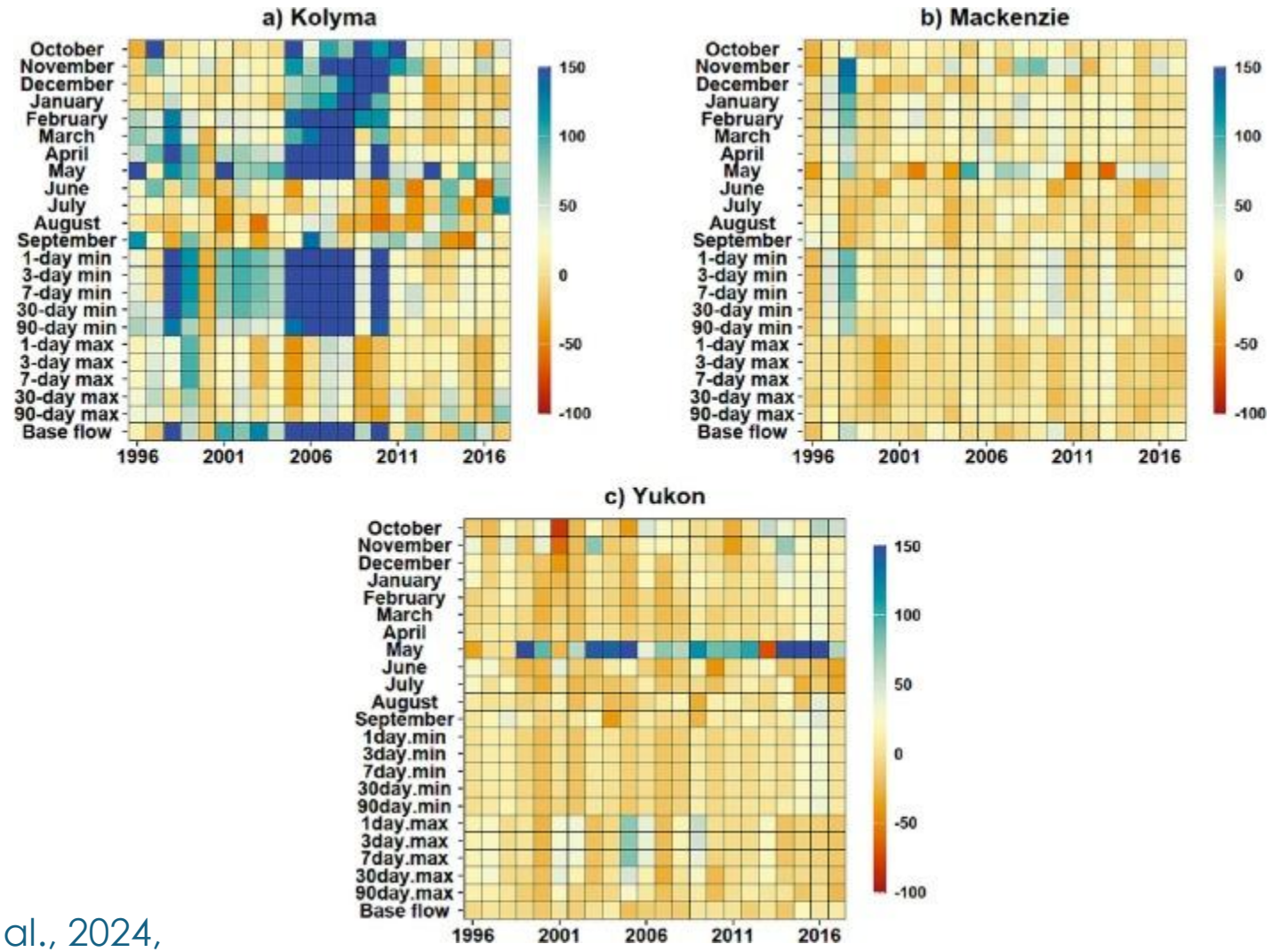
Matthews et al., 2025, (https://doi.org/10.1016/j.jhydrol.2024.132460)

Fig. 1. An overview of the 1675 REDES gauge locations. Rainfall erosivity events were simulated at all locations (black and white points) in EMOf over the full EMO temporal extent (1990–2023), however only white points contain overlapping events between the REDES and EMO records (1990–2014). A further portion of locations (for example Austria) are not included in the REDES events database (REDESe) due to privacy restrictions on the event-scale data.

Example 4

What's your thoughts???

- The colour scale is appropriate.
- The amplitude of colour interval is adequate.



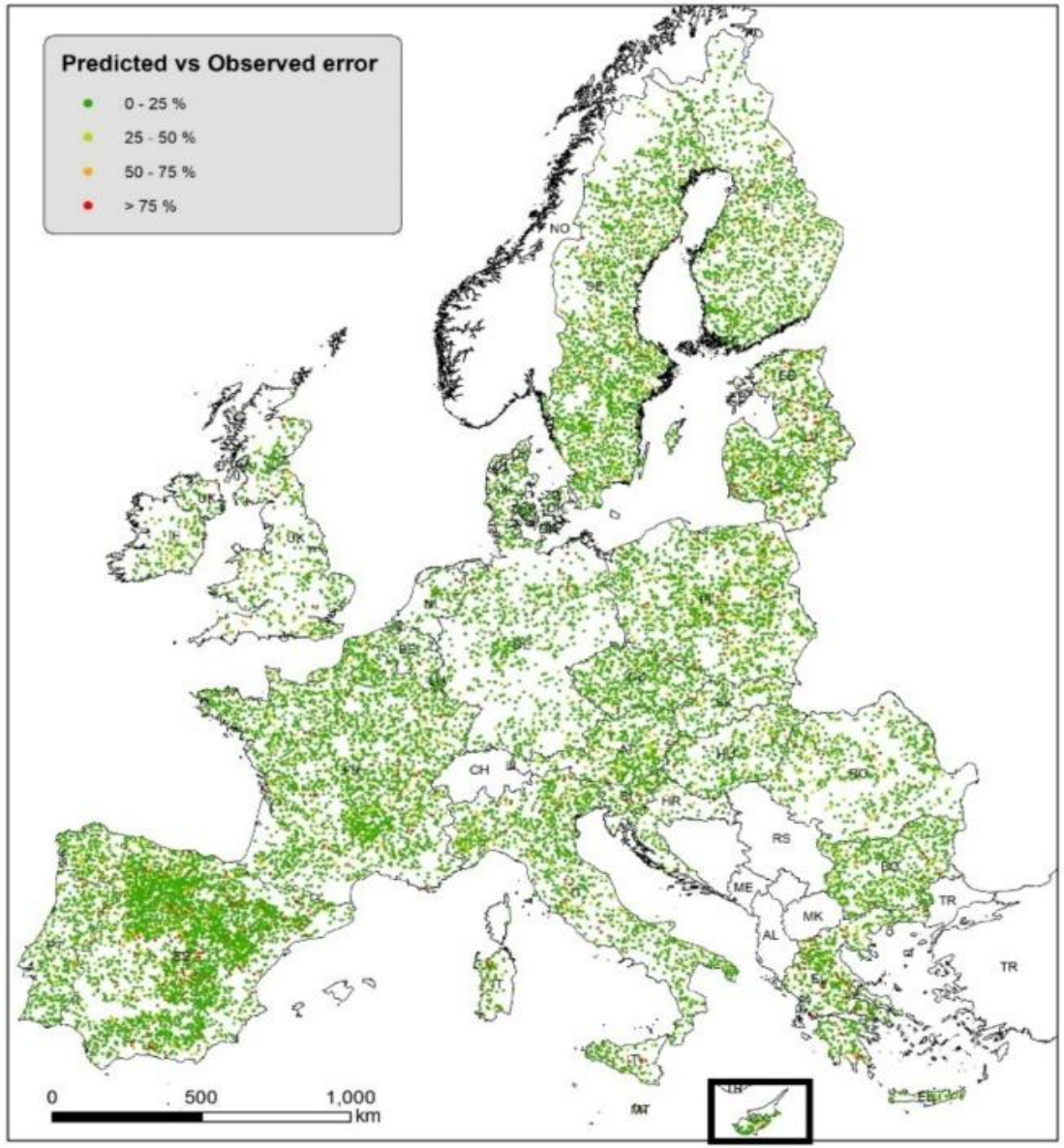
Patro et al., 2024, (https://doi.org/10.1016/j.gloplacha.2024.104442)

Fig. 3. Heat map quantifying the alteration of the flow regime metrics along the a) Kolyma, b) Mackenzie, and c) Yukon rivers according to relative annual discrepancies between pre-and post-impact/dam periods. The legend shows the color key corresponding to variation in the magnitude of the flow regime metrics.

Example 5

What's your thoughts???

- Strategic use of colour and chart type.
- Able to visualise the information.
- Legend symbols should be changed.



Schillaci et al. (2025)

(https://doi.org/10.1016/j.geoderma.2025.117199)

Fig. 7. Spatial distribution of the prediction error.

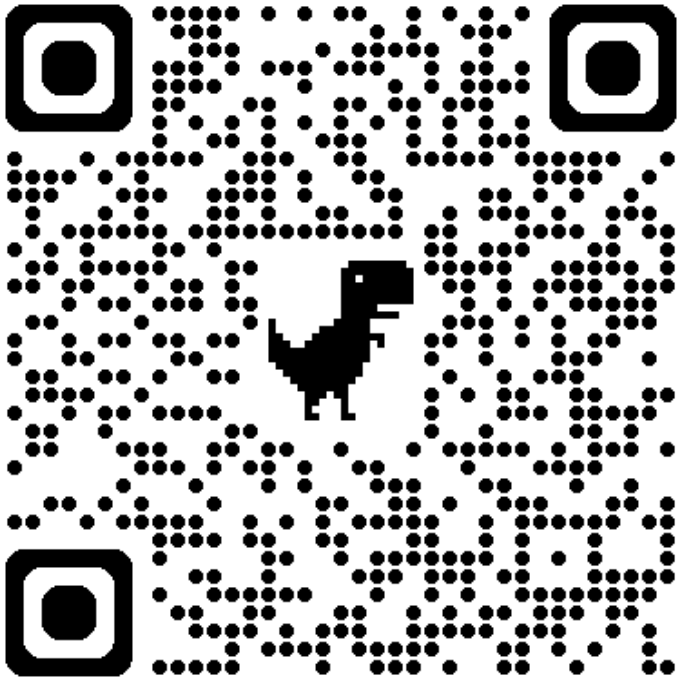
CLIMATE DATA OPERATORS (CDO)

Climate Data Operators (CDO)

CDO is a collection of command line Operators to manipulate and analyse **Climate** and (Numerical Weather Prediction) **NWP** model Data.

Supported data formats are **GRIB 1/2**, **netCDF 3/4**, SERVICE, EXTRA and IEG.

There are **more than 600 operators** available.



Find out about it here:

https://code.mpimet.mpg.de/projects/cdo

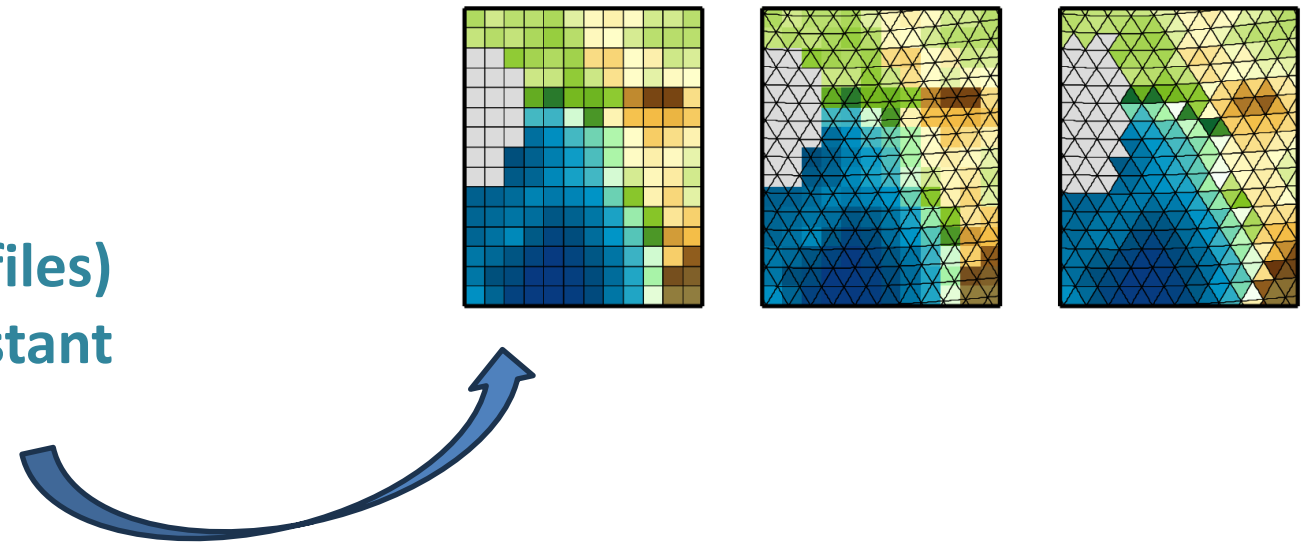
Climate Data Operators (CDO)

What can we do with CDO?

CDO is perfect for data **manipulation**, **analysis**, and **transformation**.

Examples:

- **spatial average**
- **temporal averages**
- **sum,min,max**
- **add or subtract two fields (*.nc files)**
- **add, subtract, multiply by a constant**
- **Remapping**



How can we install CDO?

Install CDO on your system.

Linux: use the terminal: **sudo apt install cdo**

Windows 10/11: download Windows Subsystem for Linux first, then use the terminal

Climate Data Operators (CDO)

How can we use CDO?

CDO is primarily a **command-line tool**. You must **use the terminal** to execute commands.

Synopsis:

cdo ***<operator>*** **infile.nc outfile.nc**

- **spatial average** — cdo ***fldmean*** infile.nc outfile.nc
- **temporal averages** — cdo ***timmean*** infile.nc outfile.nc
- **Add, subtract two fields (*.nc files)** — cdo ***sub*** infile1.nc infile2.nc outfile.nc
- **add, sub, multiply by a constant** — cdo ***mulc,86400*** infile.nc outfile.nc
- **Remapping** — cdo ***remapbil,r360x180*** infile.nc outfile.nc

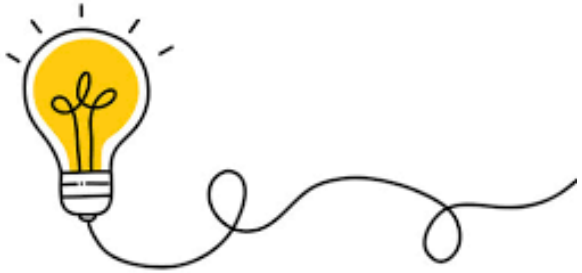
Climate Data Operators (CDO)

Can we plot something with CDO?

cdo does not have a graphical interface!

You need to accompany it with something else in order to **view** or **plot** the output.

A platform such as ***Panoply***!



PANOPLY

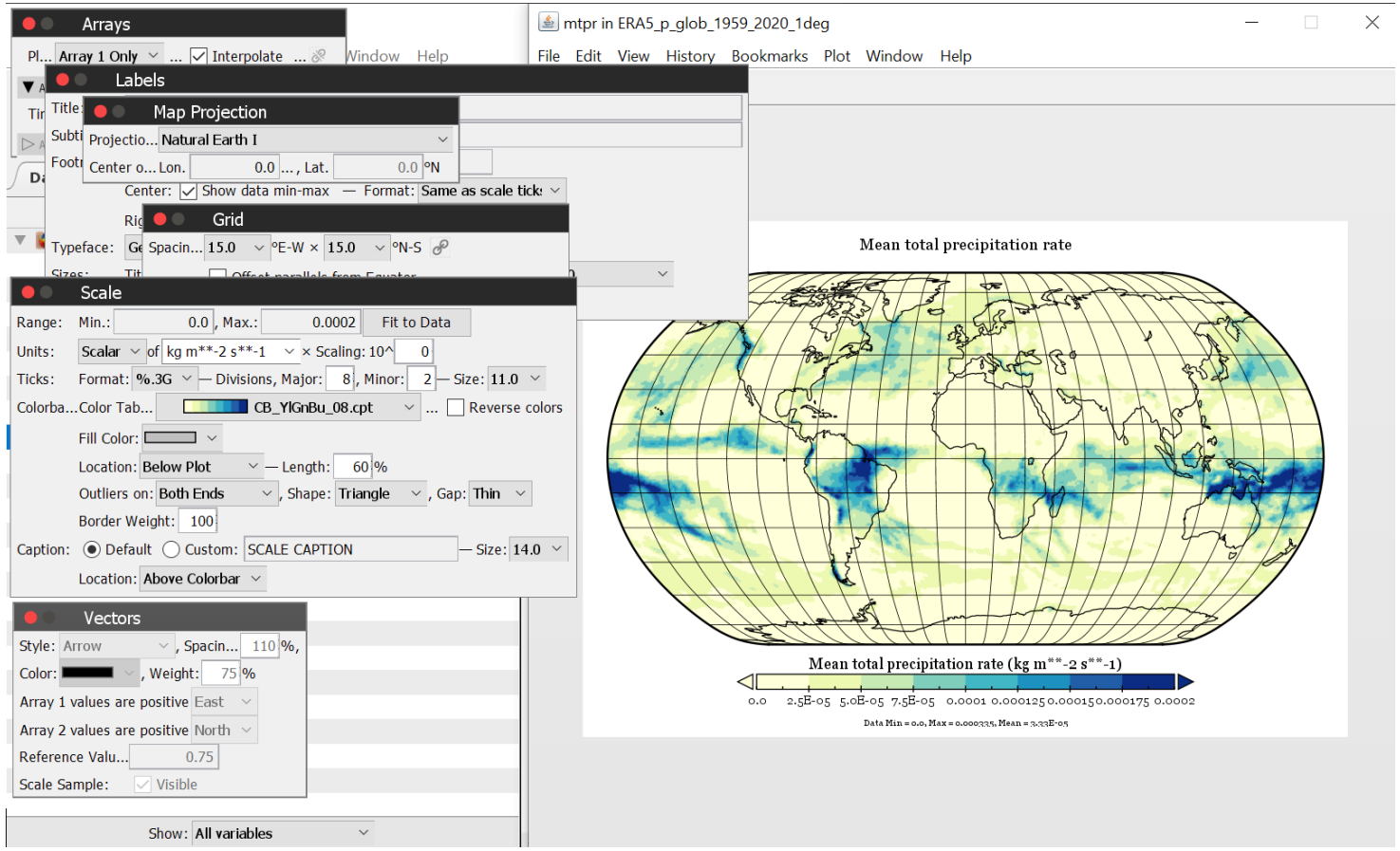
Panoply netCDF, HDF and GRIB Data Viewer

panoply \PAN-uh-plee\, noun: 1. A splendid or impressive array. ...

Panoply plots georeferenced and other arrays from netCDF, HDF, GRIB, etc.

Panoply is a cross-platform application; runs on Macintosh, Windows, Linux and other desktop computers.

Must have: a compatible **Java 11** (or later version) JRE or JDK installed.

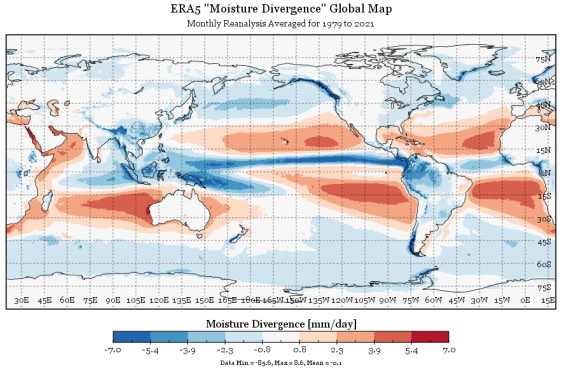


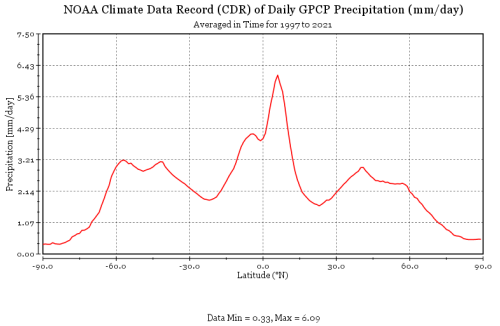
Panoply netCDF, HDF and GRIB Data Viewer

panoply \PAN-uh-plee\, noun: 1. A splendid or impressive array. ...

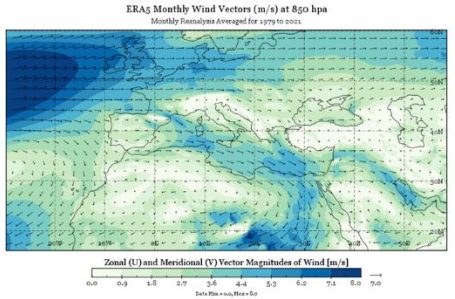
With ***Panoply 5*** you can:

- Create color contour plots of geo-referenced lat-lon, lat-vertical, lon-vertical, time-lat or time-vertical arrays from 2D or larger multi-D variables.
- Create line plots of data from 1D or larger multi-D variables.
- Combine two geo-referenced arrays in one plot by subtracting, summing, averaging, merging, etc.
- Plot global or regional maps using over 200 map projections or make a zonal average line plot.
- Use numerous color tables for the scale colorbar, or apply your own custom RGB color table (e.g., use colorbrewer).
- Export animations as MP4 video, or collection of individual frames.

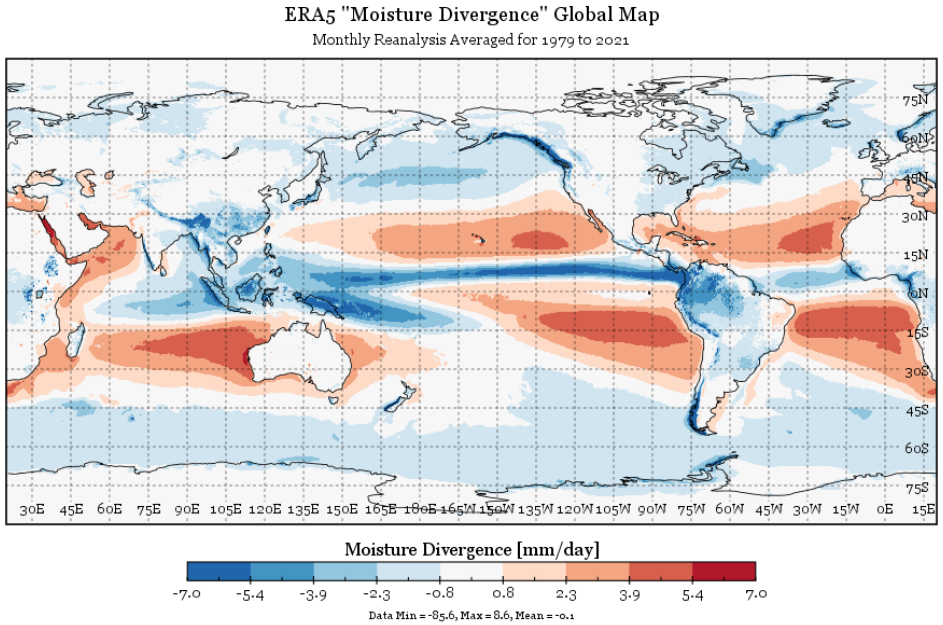


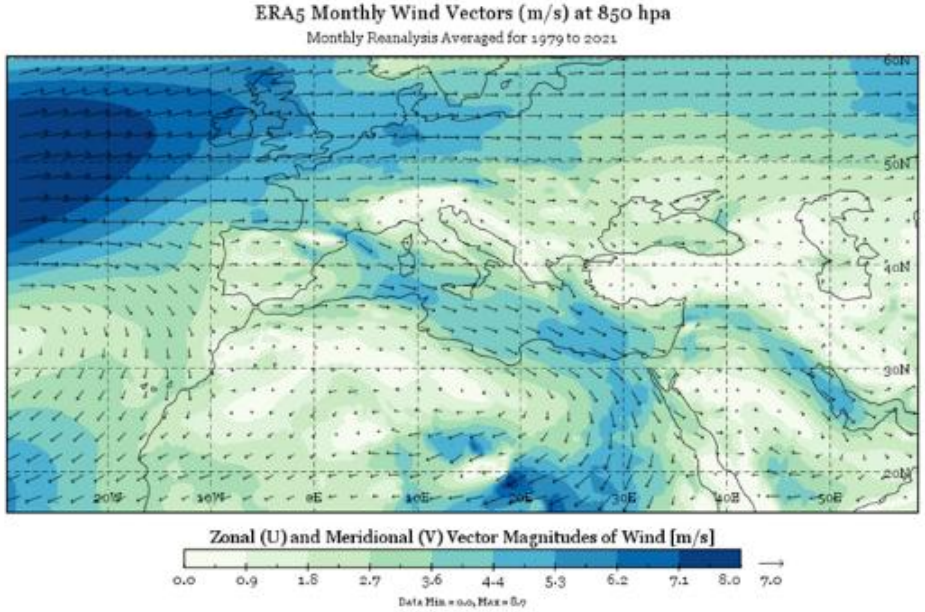


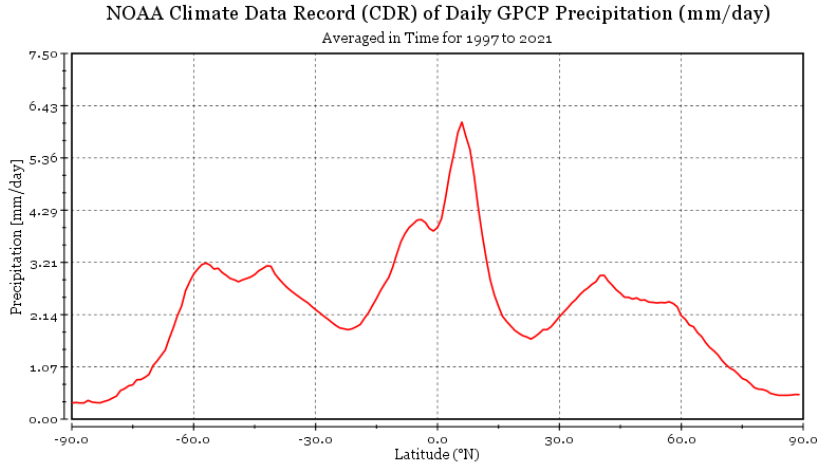
Data Min = 0.33, Max = 6.09



Panoply netCDF, HDF and GRIB Data Viewer







Data Min = 0.33, Max = 6.09

Panoply netCDF, HDF and GRIB Data Viewer

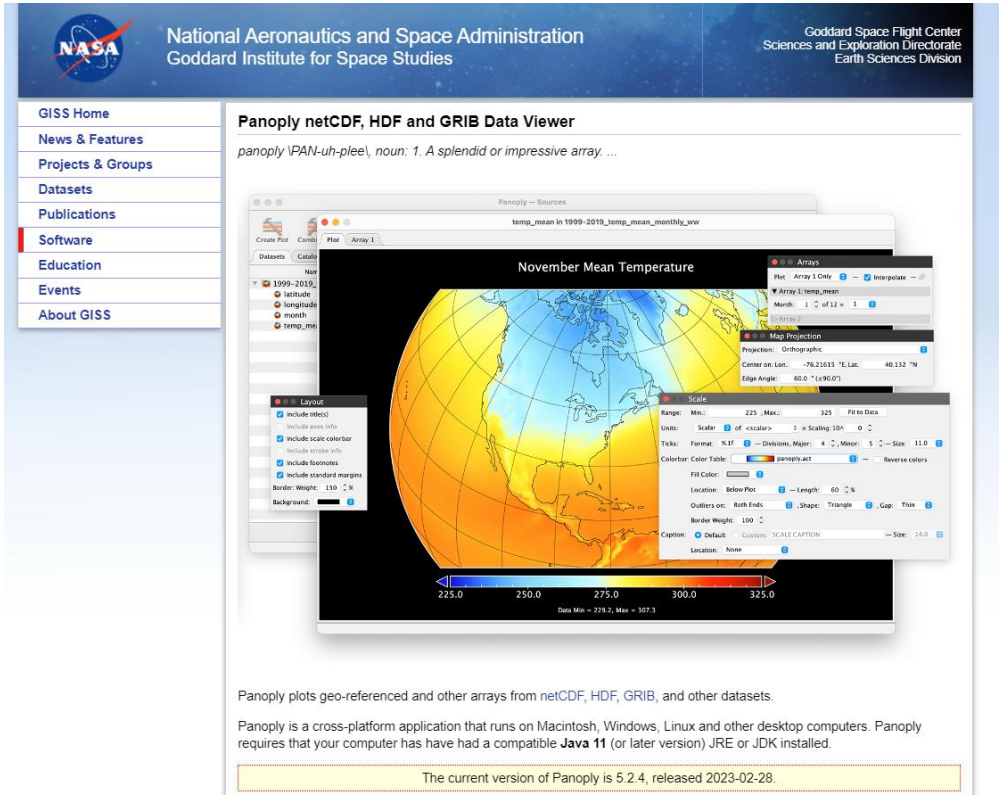
panoply \PAN-uh-plee\, noun: 1. A splendid or impressive array. ...

Where and how??

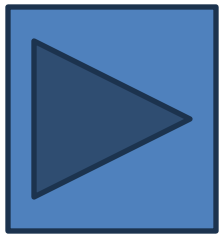
Google: **Panoply data viewer**

https://www.giss.nasa.gov/tools/panoply/

Scroll down and find the **Download Panoply** option.

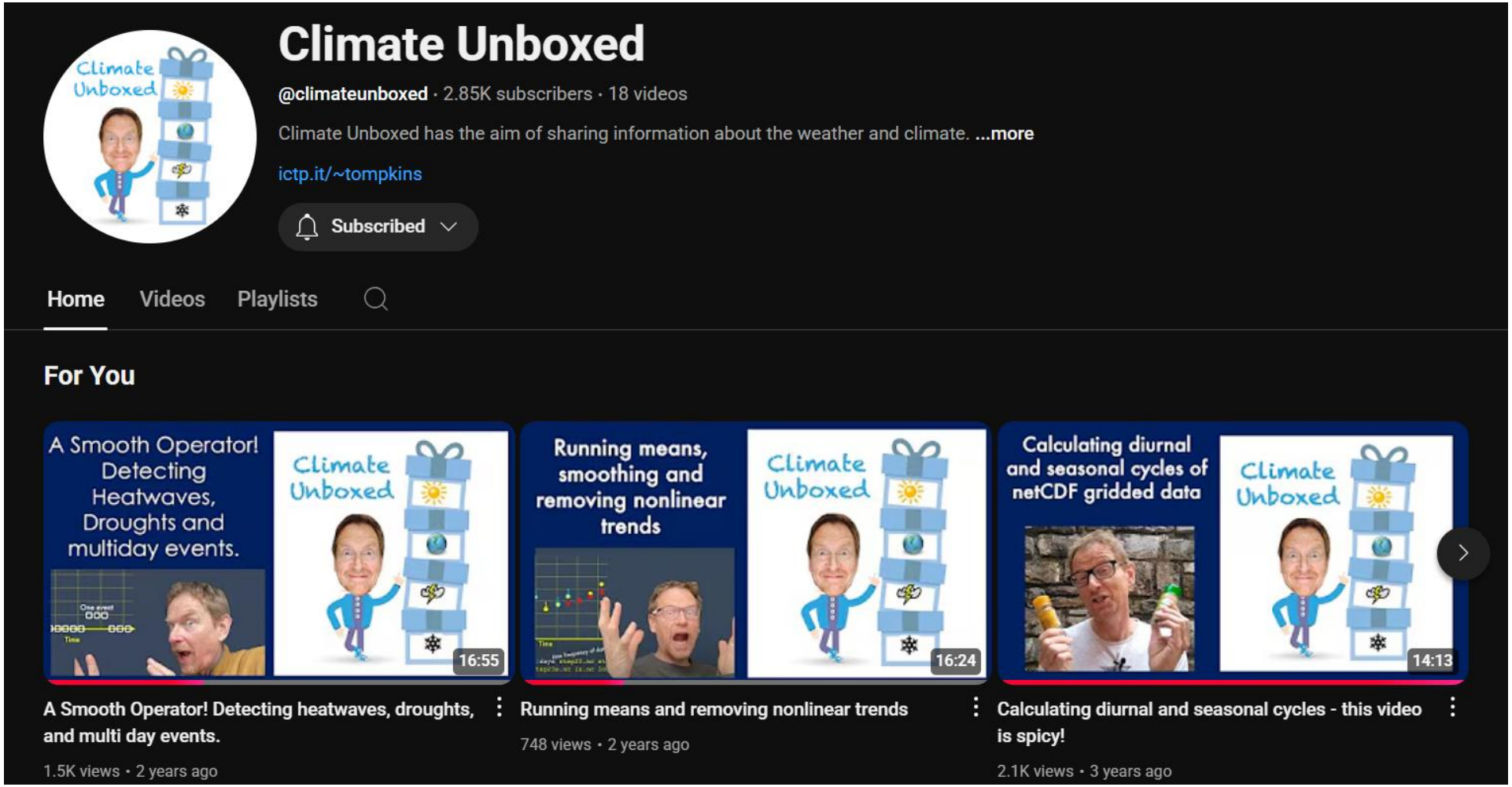


Using CDO and Panoply



More resources on CDO and dealing with netcdf data:

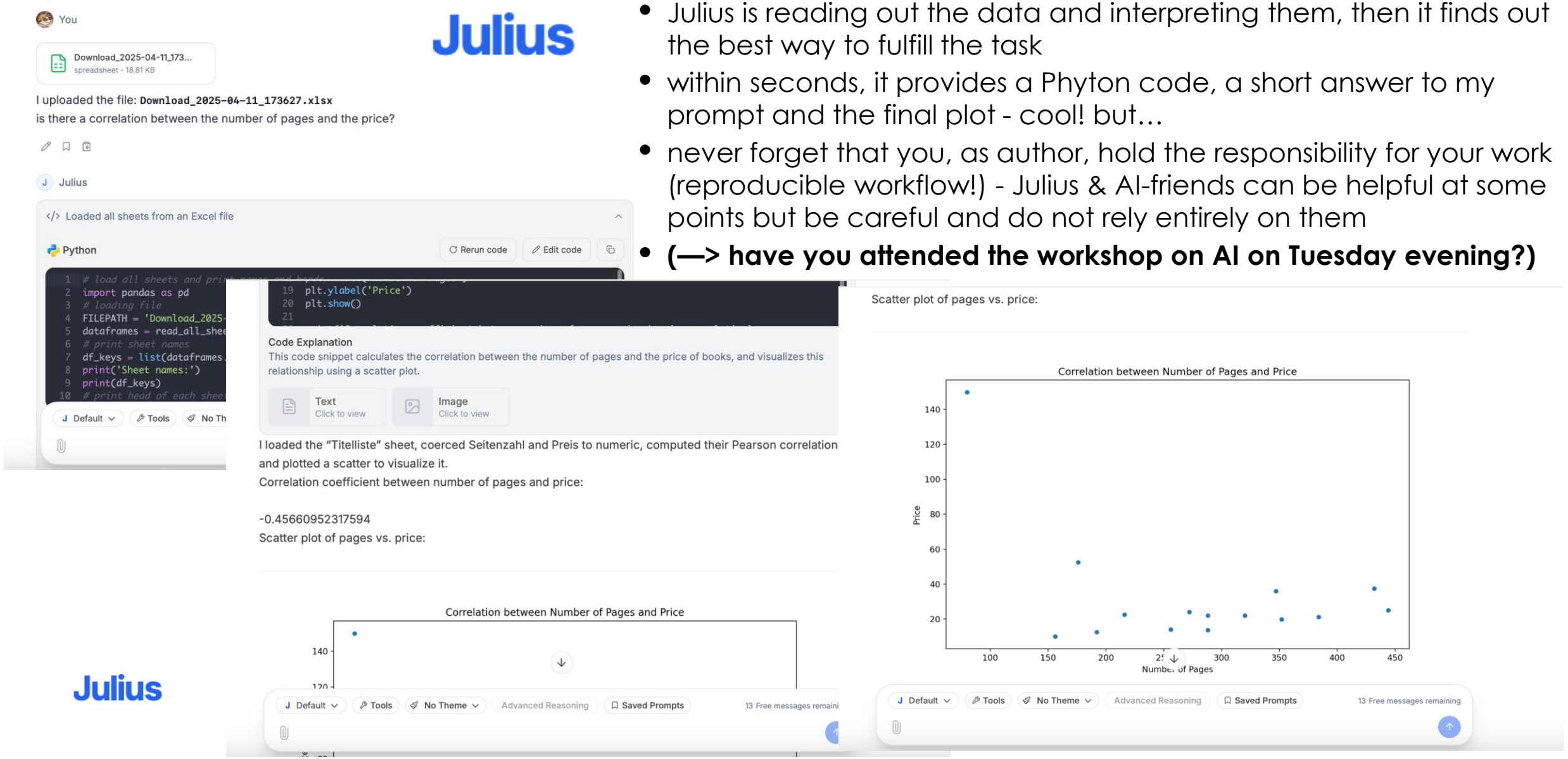
Shout-out to **@climateunboxed** **YouTube channel** – by **Adrian Tompkins** (**ICTP-Italy**)



AI TOOLS FOR DATAVIZ

This is just one example:

- many options available online. This is just one example: Julius
- here I uploaded a data table and asked to analyze the correlation between two variables
- Julius is reading out the data and interpreting them, then it finds out the best way to fulfill the task
- within seconds, it provides a Phyton code, a short answer to my prompt and the final plot - cool! but…
- never forget that you, as author, hold the responsibility for your work (reproducible workflow!) - Julius & AI-friends can be helpful at some points but be careful and do not rely entirely on them
- **(—> have you attended the workshop on AI on Tuesday evening?)**

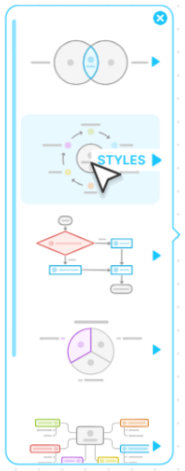


Napkin.ai

Home Pricing About us

Get visuals from your text

Napkin turns your text into visuals so sharing your ideas is quick and effective.



https://www.napkin.ai/

Another example:

Scaling and intermittency in time of urban precipitation in Warsaw, Poland

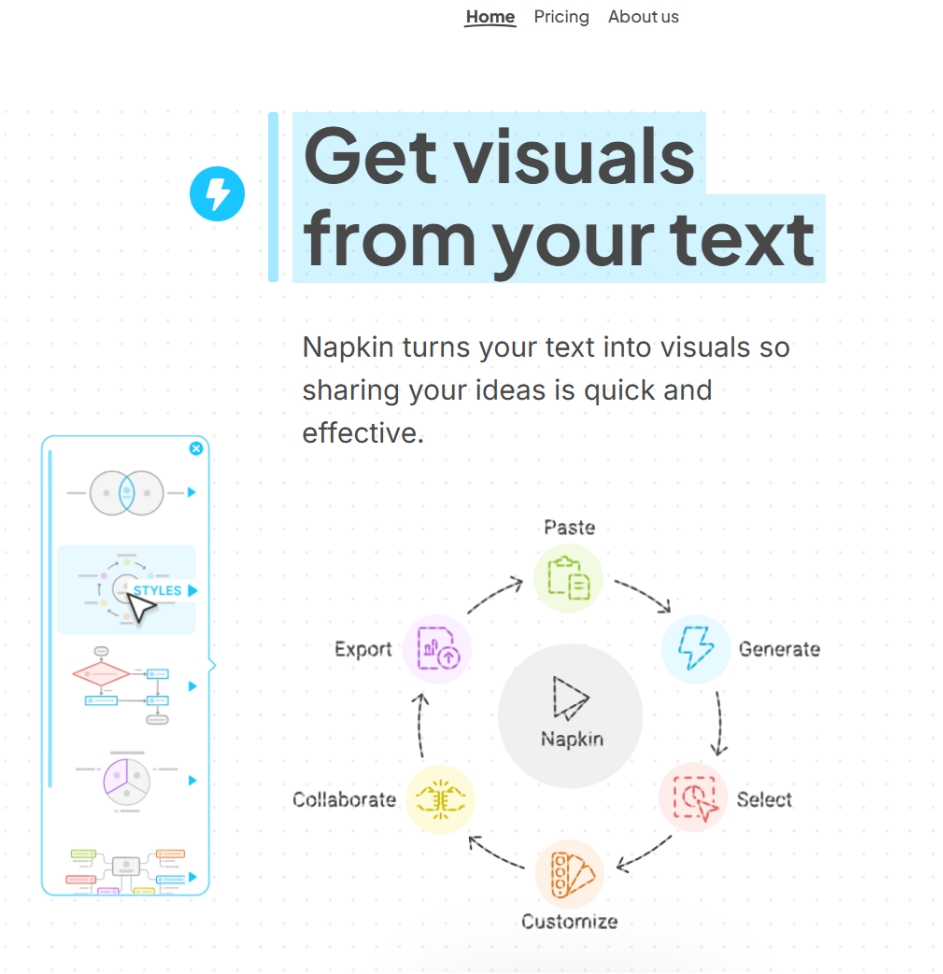
- Multifractal analysis of Warsaw's 1-minute precipitation data.
- Estimation of parameters α, *C1* and *H* by applying 5 multifractal geometry methods.
- Majority of Warsaw rain gauges have distinct similarity of multifractal properties.
- Cascade generators could be used in generating high resolution precipitation.
- Practical parameterization of the cascade generator with only two multifractal parameters.

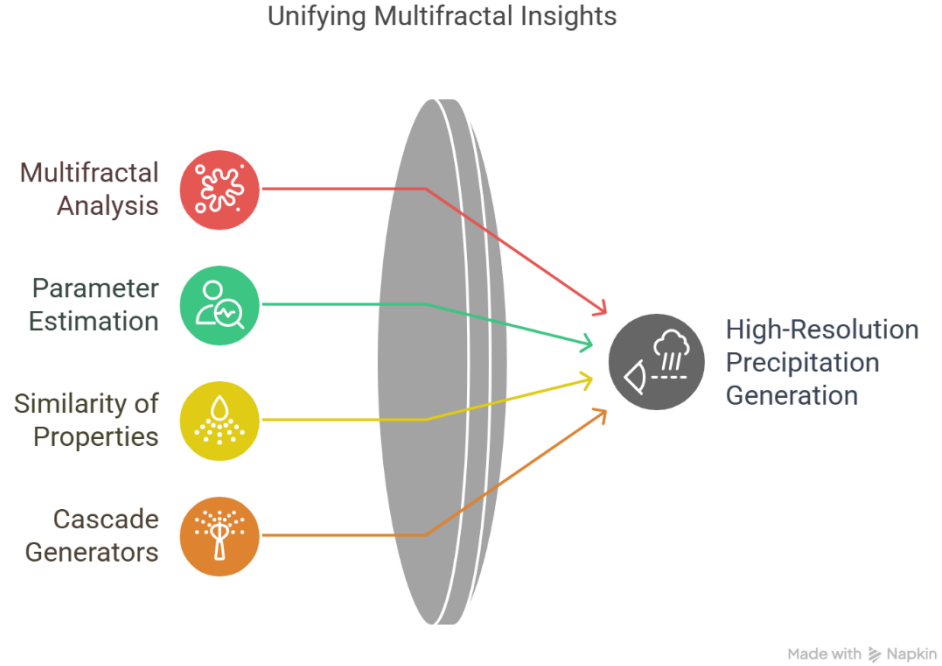
Dzugaj et al. (2023) (https://doi.org/10.1016/j.ejrh.2023.101440)

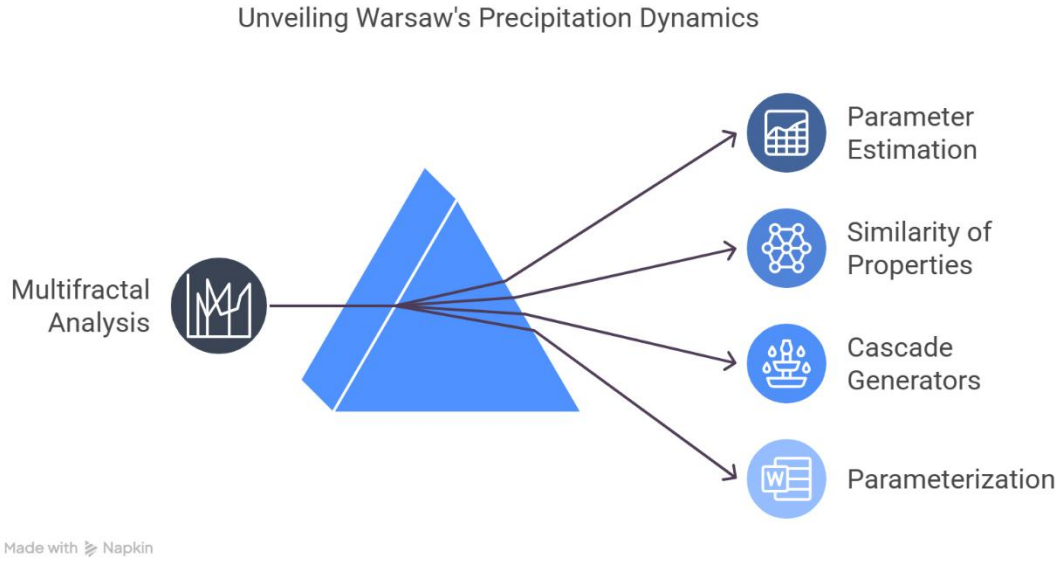
Napkin beta

Napkin.ai

Generate Visuals:







Napkin beta

https://www.napkin.ai/

ChatGPT

ChatGPT

ELSEVIER

Journal of Hydrology: Regional Studies

Volume 48, August 2023, 101440

Scaling and intermittency in time of urban precipitation in Warsaw, Poland

Dagmara Dżugaj [a b], Epari Ritesh Patro [c], Carlo De Michele [d], Pawel Licznar [e]

Show more

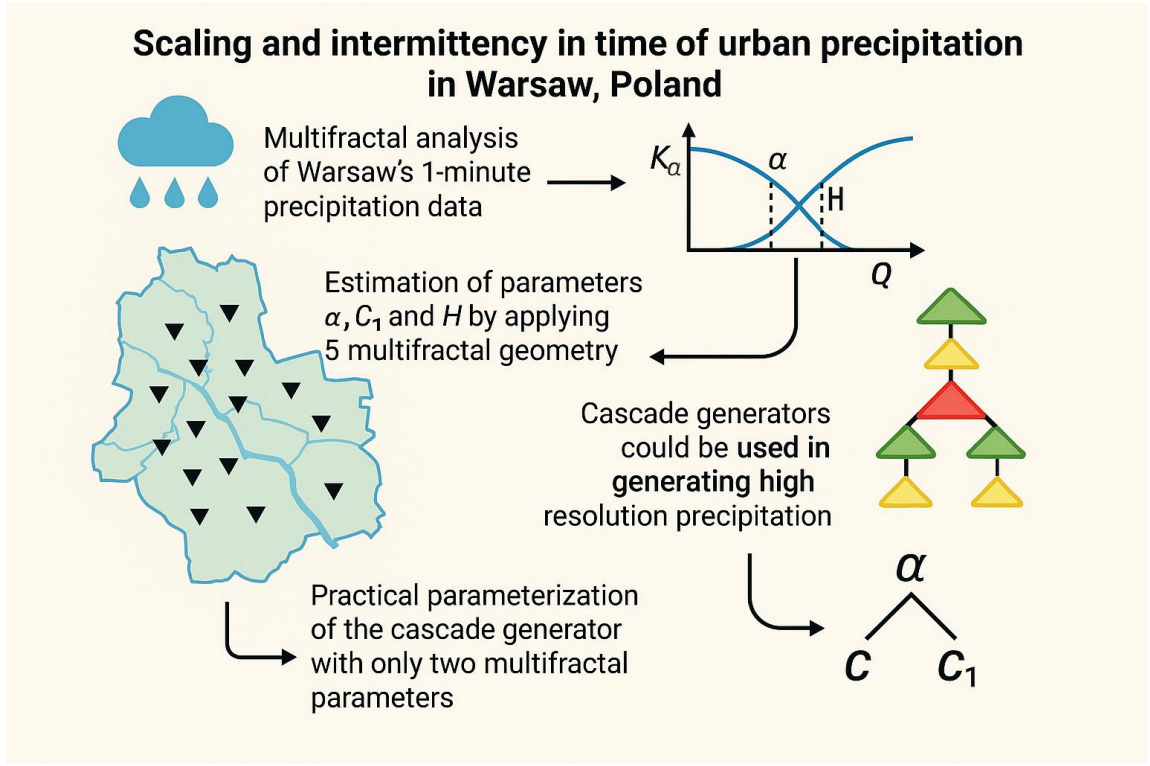
+ Add to Mendeley Share Cite

https://doi.org/10.1016/j.ejrh.2023.101440

Get rights and content

Highlights

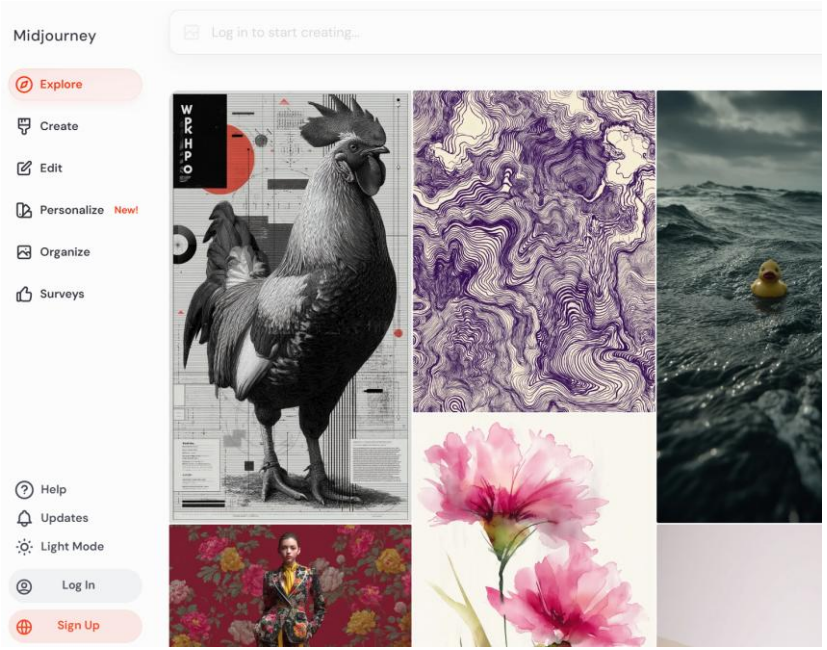
- Multifractal analysis of Warsaw's 1-minute precipitation data.
- Estimation of parameters α, C_1 and H by applying 5 multifractal geometry methods.



ChatGPT

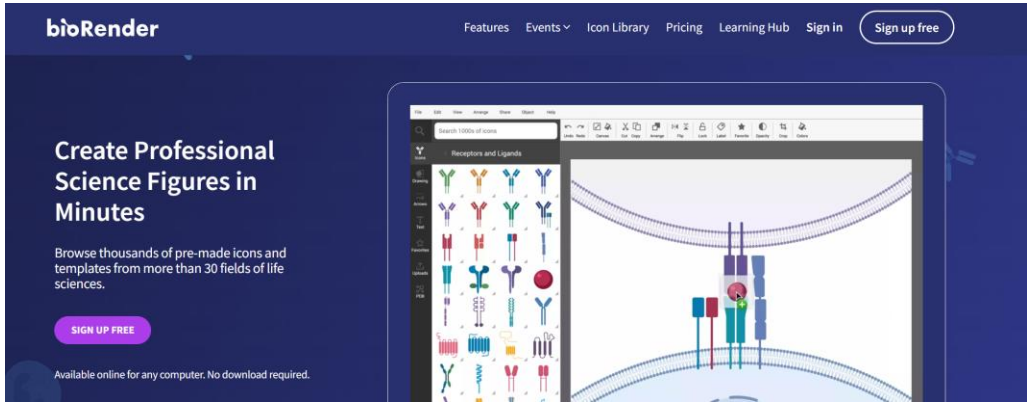
Other Tools:

- There are a lot but here are few I have used !



Midjourney

manus



bioRender

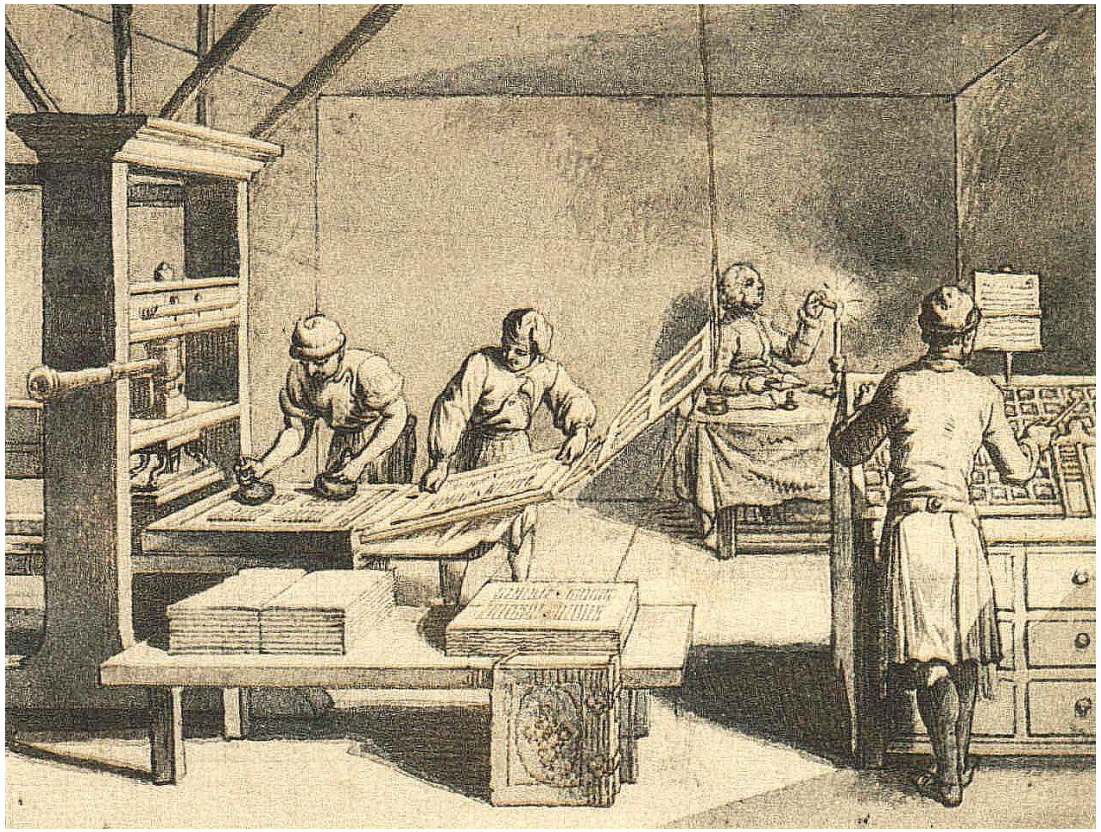
Are AI tools perfect !!

- Absolutely Not.
- But Makes thing easier
- Check Always and Test with your Prompts
- Of course, better results with paid versions
- Transforming the Way, We Create Research Visuals

PUBLICATION COMPLIANCE

Always check the publisher guidelines

- Formats
- Image sizes
- Resolution



Formats: raster vs vector graphics

Raster:

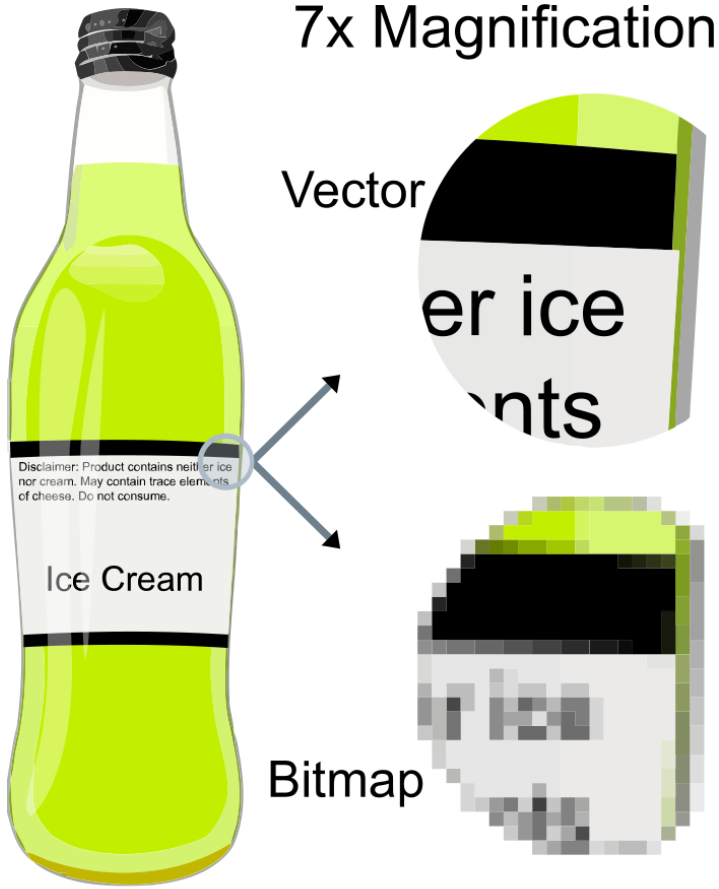
***.jpg, *.png, or *.tif**

- Better for photographs and subtle color variation
- *.png recommended over *.jpg except for photos

Vector

***.pdf, *.ps, *.eps**

- Better for everything else



Resolution: 300 dpi

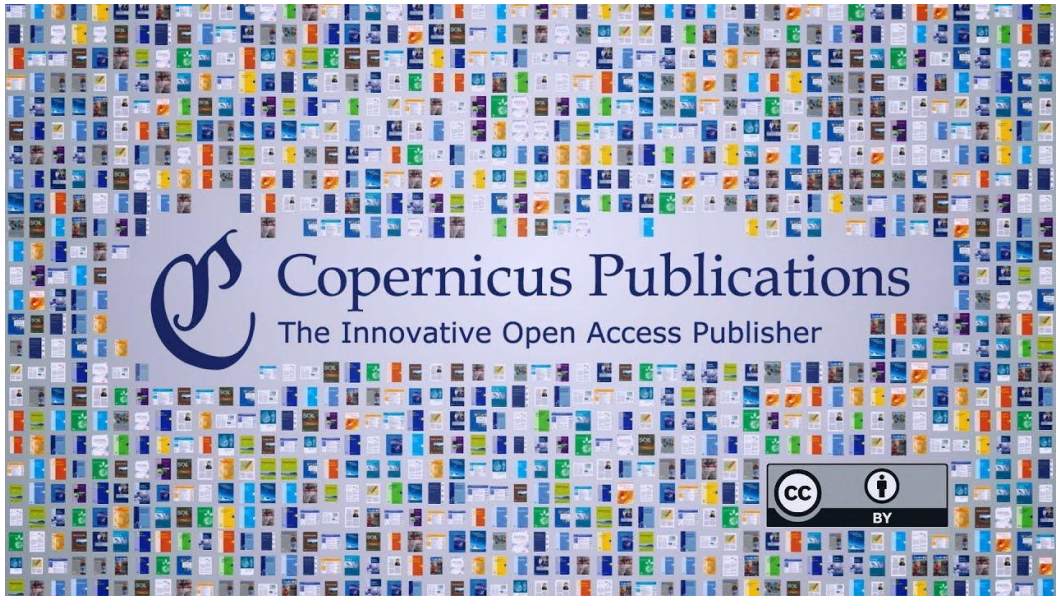
- dpi = dots-per-inch
- Resolution depends on size of final figure, but only for raster images.

563 pixel / 4.5 inch = 125 dpi

96 pixel / 4.5 inch = 21 dpi

DataViz from the publisher's perspective

Sarah Schneemann & Natascha Töpfer



Copernicus, Editorial Support
(typesetting, image processing)

DataViz from the publisher's perspective

What happens to the article's figures after submission?

- Does it follow our guidelines?
- Reproduction rights have been secured?
- Copyright statements or credits are included, e.g., in the maps and aerials, according to the regulations of the provider?
- No further editing at this stage

DataViz from the publisher's perspective

What happens to the article's figures after submission?

Production file validation

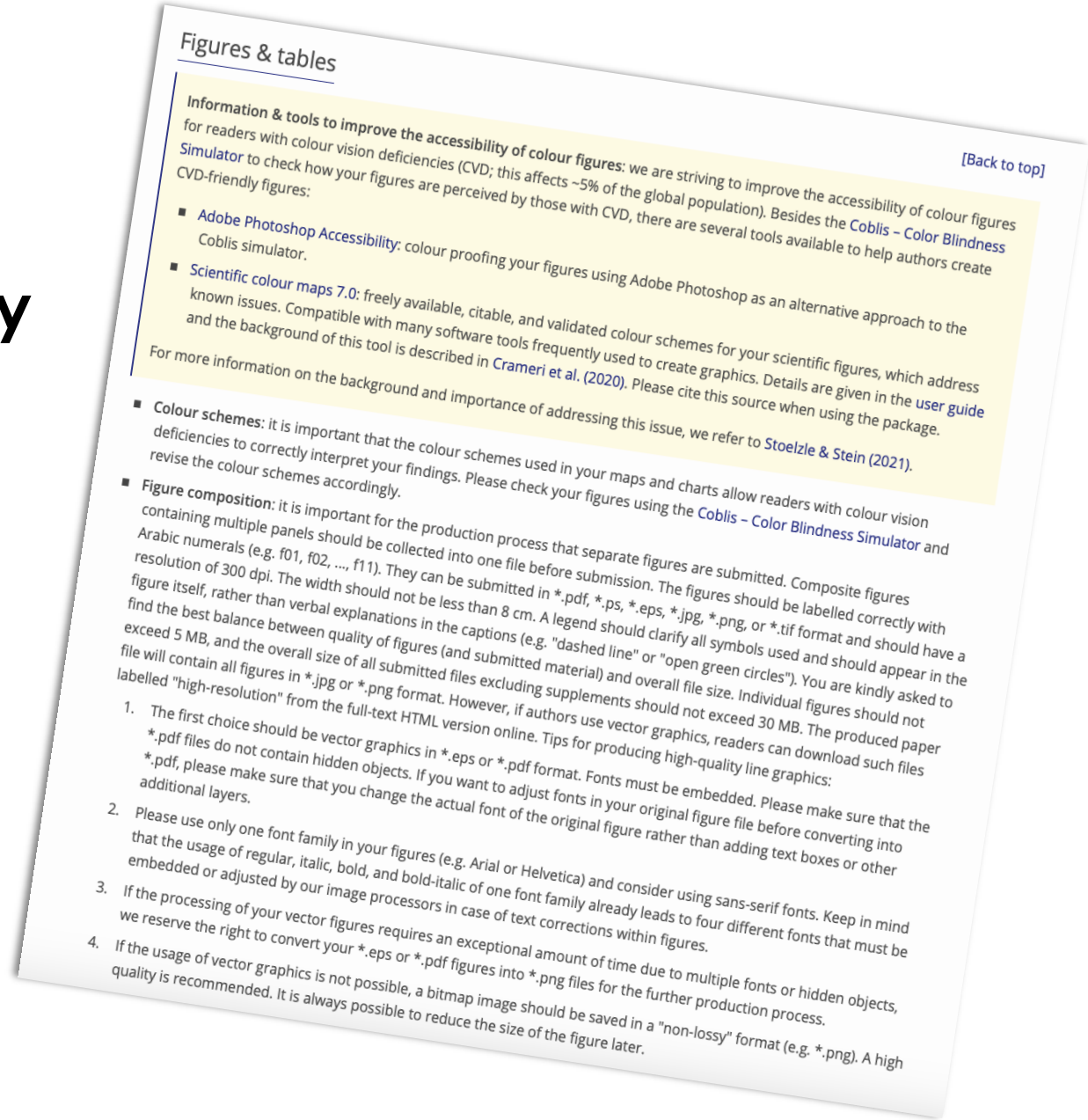
- the figure files uploaded are identical to the accepted PDF version?
- Again, reproduction rights and copyright statements or credits
- Figures quality
- Figure format

Image processing

- Figures are processed to ensure a decent quality: sharpening, cropping, cleaning
- Lite language editing is applied
- All figures are saved in four different formats

DataViz from the publisher's perspective

… **about figures' accessibility**



Figures & tables

[Back to top]

Information & tools to improve the accessibility of colour figures: we are striving to improve the accessibility of colour figures for readers with colour vision deficiencies (CVD; this affects ~5% of the global population). Besides the Coblis – Color Blindness Simulator to check how your figures are perceived by those with CVD, there are several tools available to help authors create CVD-friendly figures:

- Adobe Photoshop Accessibility: colour proofing your figures using Adobe Photoshop as an alternative approach to the Coblis simulator.
- Scientific colour maps 7.0: freely available, citable, and validated colour schemes for your scientific figures, which address known issues. Compatible with many software tools frequently used to create graphics. Details are given in the user guide and the background of this tool is described in Crameri et al. (2020). Please cite this source when using the package.

For more information on the background and importance of addressing this issue, we refer to Stoelzle & Stein (2021).

- **Colour schemes**: it is important that the colour schemes used in your maps and charts allow readers with colour vision deficiencies to correctly interpret your findings. Please check your figures using the Coblis – Color Blindness Simulator and revise the colour schemes accordingly.
- **Figure composition**: it is important for the production process that separate figures are submitted. Composite figures containing multiple panels should be collected into one file before submission. The figures should be labelled correctly with Arabic numerals (e.g. f01, f02, ..., f11). They can be submitted in *.pdf, *.ps, *.eps, *.jpg, *.png, or *.tif format and should have a resolution of 300 dpi. The width should not be less than 8 cm. A legend should clarify all symbols used and should appear in the figure itself, rather than verbal explanations in the captions (e.g. "dashed line" or "open green circles"). You are kindly asked to find the best balance between quality of figures (and submitted material) and overall file size. Individual figures should not exceed 5 MB, and the overall size of all submitted files excluding supplements should not exceed 30 MB. The produced paper file will contain all figures in *.jpg or *.png format. However, if authors use vector graphics, readers can download such files labelled "high-resolution" from the full-text HTML version online. Tips for producing high-quality line graphics:

1. The first choice should be vector graphics in *.eps or *.pdf format. Fonts must be embedded. Please make sure that the *.pdf files do not contain hidden objects. If you want to adjust fonts in your original figure file before converting into *.pdf, please make sure that you change the actual font of the original figure rather than adding text boxes or other additional layers.
2. Please use only one font family in your figures (e.g. Arial or Helvetica) and consider using sans-serif fonts. Keep in mind that the usage of regular, italic, bold, and bold-italic of one font family already leads to four different fonts that must be embedded or adjusted by our image processors in case of text corrections within figures.
3. If the processing of your vector figures requires an exceptional amount of time due to multiple fonts or hidden objects, we reserve the right to convert your *.eps or *.pdf figures into *.png files for the further production process.
4. If the usage of vector graphics is not possible, a bitmap image should be saved in a "non-lossy" format (e.g. *.png). A high quality is recommended. It is always possible to reduce the size of the figure later.

DataViz from the publisher's perspective

… about figures' accessibility

- Initial check (review file validation stage), authors are notified about potential issues (but the review process can start)
- Authors often do not follow (or deliberately ignore) the guidelines about figures' accessibility
- All issues have to be solved before the preprint goes online
- The publisher does not force the authors to change their figures but the editor is informed informed about open issues

DataViz from the publisher's perspective

… most common mistakes, tips for authors

DataViz from the publisher's perspective

… most common mistakes, tips for authors

- Quality:
  - is often less than 300 dpi: makes it difficult to process the figure in an appropriate quality
  - sometimes the figures are much too large: it is difficult for the image processors to handle them appropriately

- Panel labelling:
  - is often missing, or too small in relation to the rest of the figure

DataViz from the publisher's perspective

… most common mistakes, tips for authors

"If one reads the guidelines first before preparing the figures, most of the mistakes can be avoided"

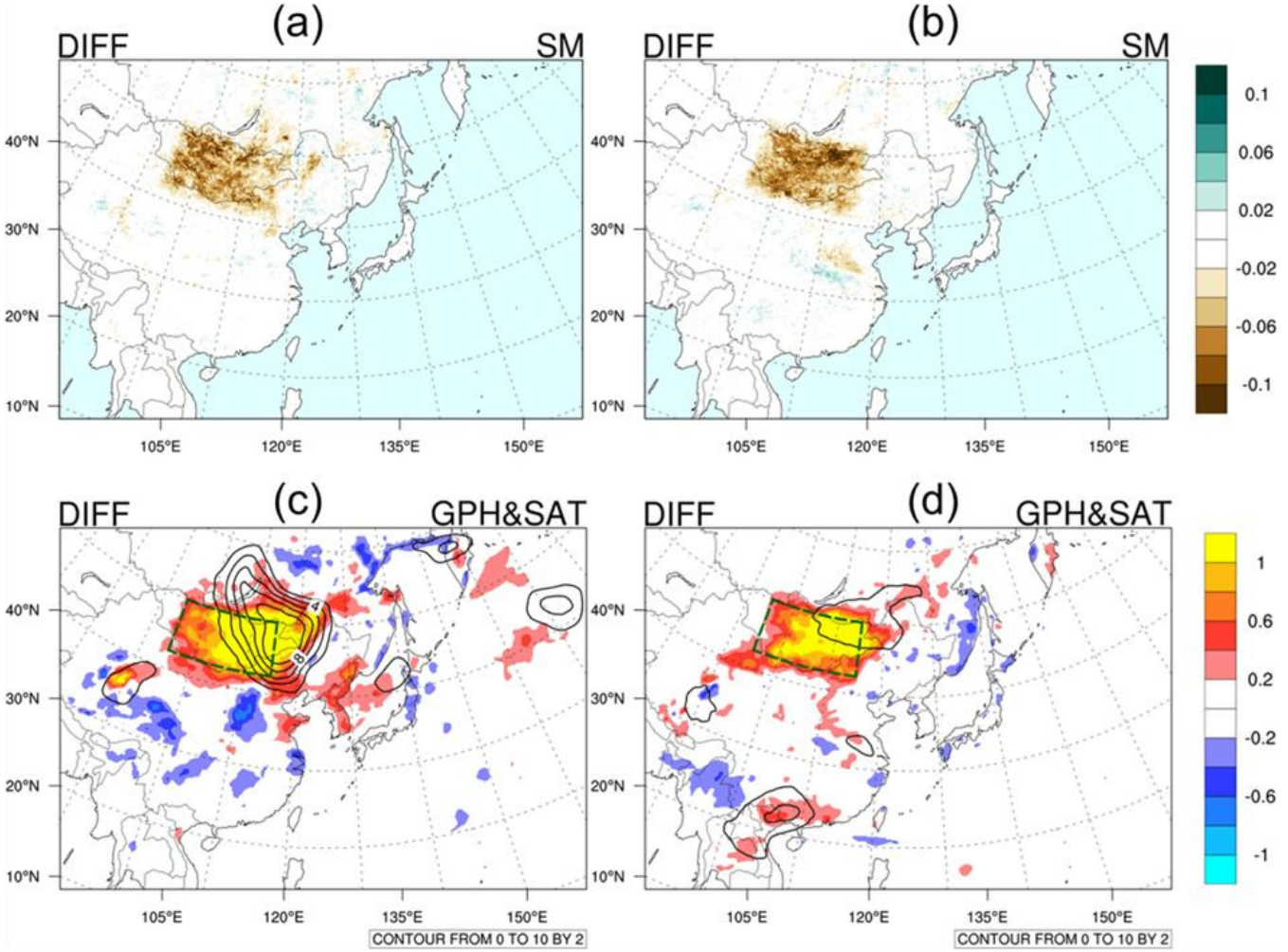
INTERACTIVE BLOCK 3

Raise your hand
if you agree with the statements/question.

Example 6

What's your thoughts???

- Easy to compare values looking at Geospatial data.
- Color scale and amplitude are optimal.



Yoon et al. (2023) https://doi.org/10.1029/2022JD037718

Fig. Differences in the (a and b) surface soil moisture content (m3 m−3), and (c and d) SAT50 (°C) (shading) with 500 GPH50 (gpm) (contour) between the LIS50 and Land Information System experiments during the simulation period of 2016 (left column) and 2018 (right column).

Example 7

What's your thoughts???

- Strategic use of colour and opacity.
- Axis labels are self-explanatory.

Matthews et al., 2025, (https://doi.org/10.1016/j.jhydrol.2024.132460)

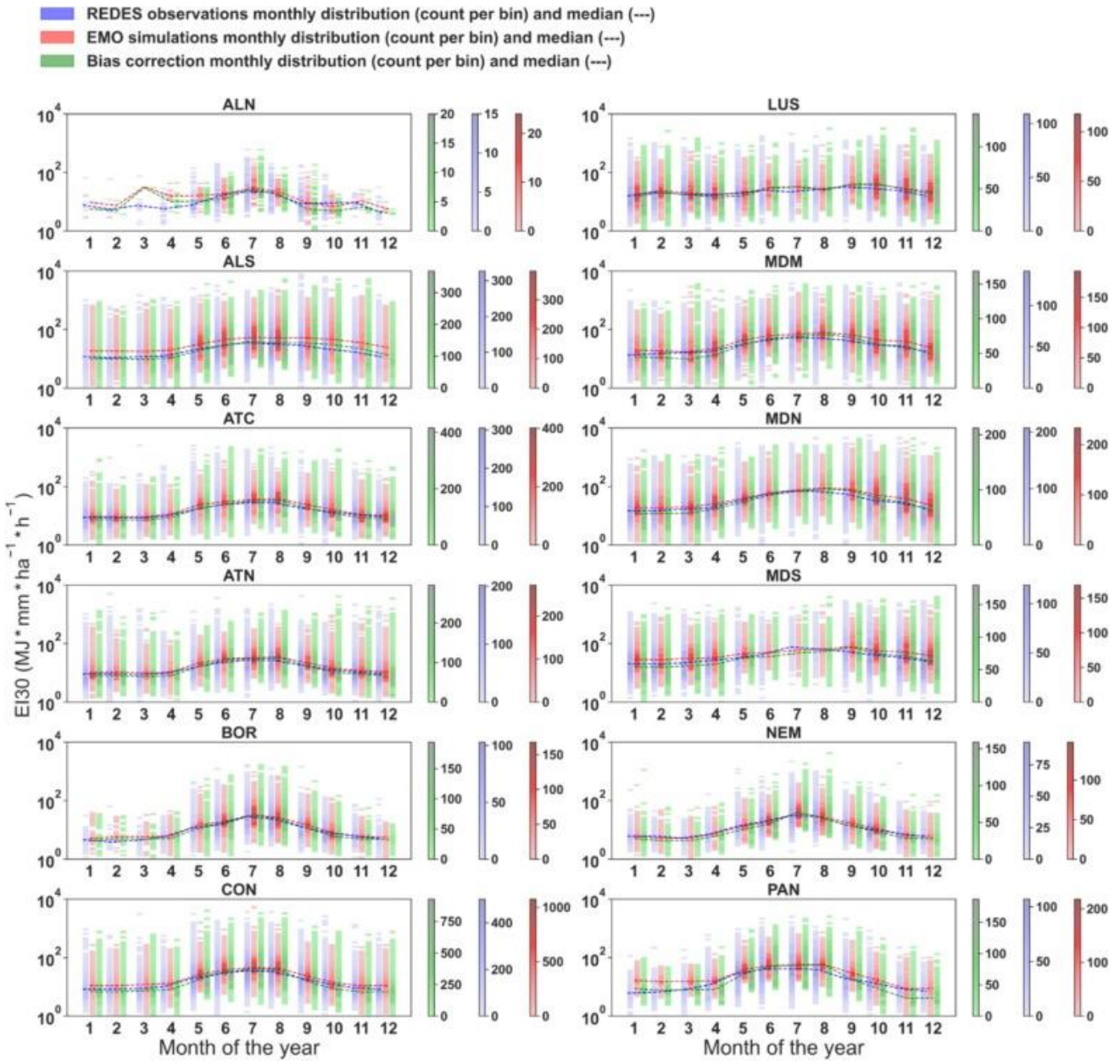
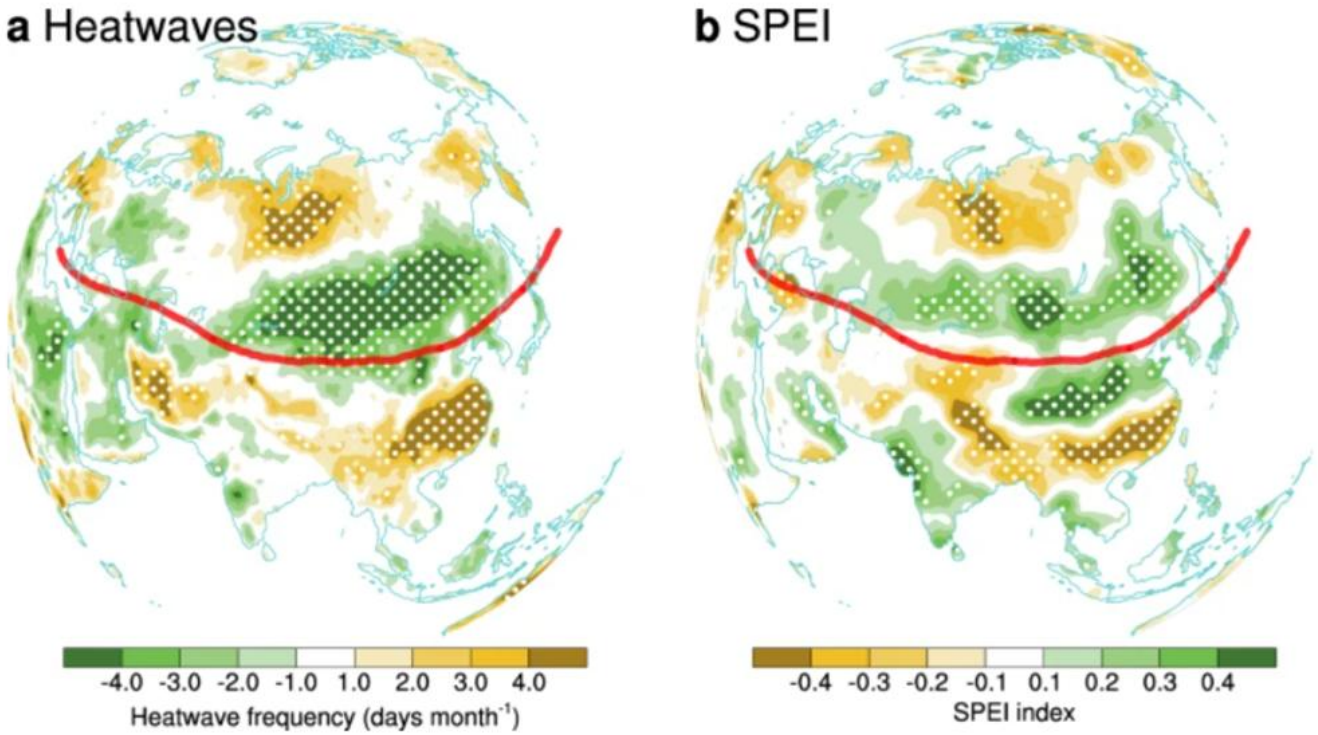


Fig. 11. Monthly comparisons of the distributions of the EI30 magnitudes for REDES gauge measurements (blue) and EMO prior to (red) and (green) bias correction (implementation 3), for each climatic (EnZ) region. For each dataset, the grid colour intensity represents the relative observation count within each rainfall EI class on a monthly basis.

Example 8

What's your thoughts???

- Easy to understand aggregated overlapping data.
- Correct scale and resolution.

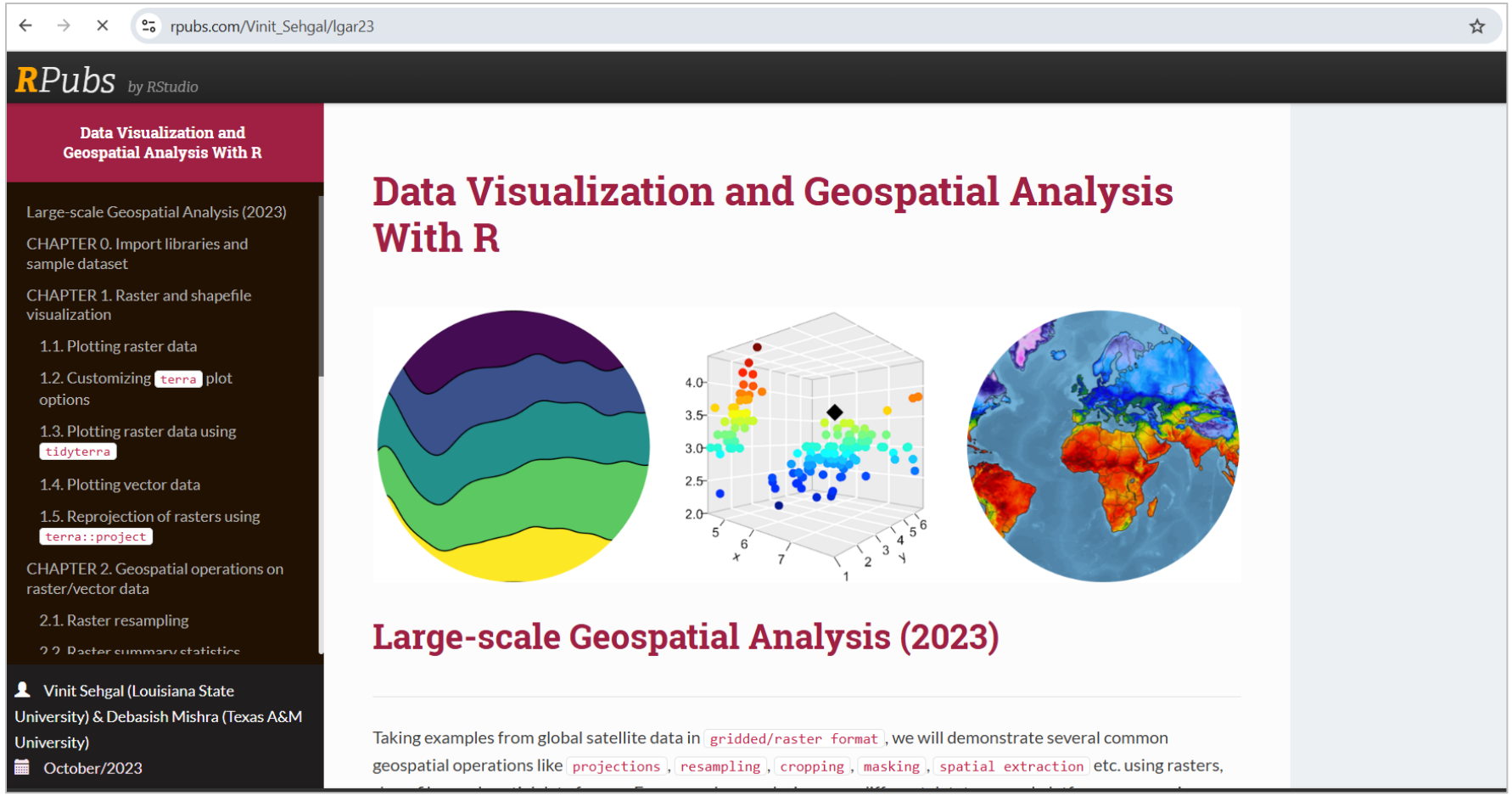


Lin et al., 2024, (https://doi.org/10.1038/s41467-024-46543-x)

Fig. a Regression map of heatwave frequency anomalies (days month−1) against the normalized EAJ index during the post-1999 period. b Same as (a), except for the standardized precipitation evapotranspiration index (SPEI). Red dash line represents the jet axis in 200 hPa in high summer. Dotted areas are statistically significant at the 0.05 level.

ADDITIONAL RESOURCES

DataViz with R



Website:
https://rpubs.com/Vinit_Sehgal/lgar23

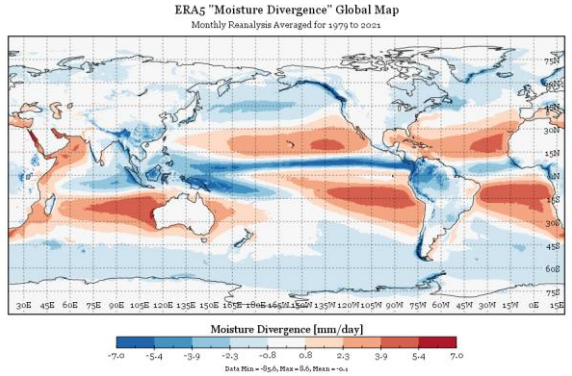
Video:
https://drive.google.com/file/d/10ZQ5l8f_JzzUk6hUCU60LgtyZMCbAq1B/view

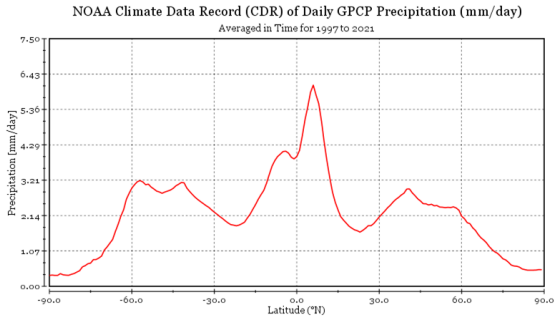
Contact Details:
debmishra@tamu.edu

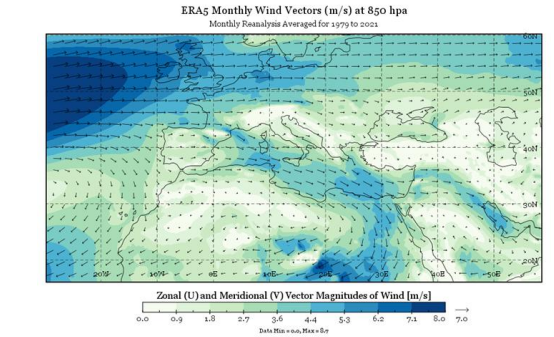
Panoply

With ***Panoply 5*** you can:

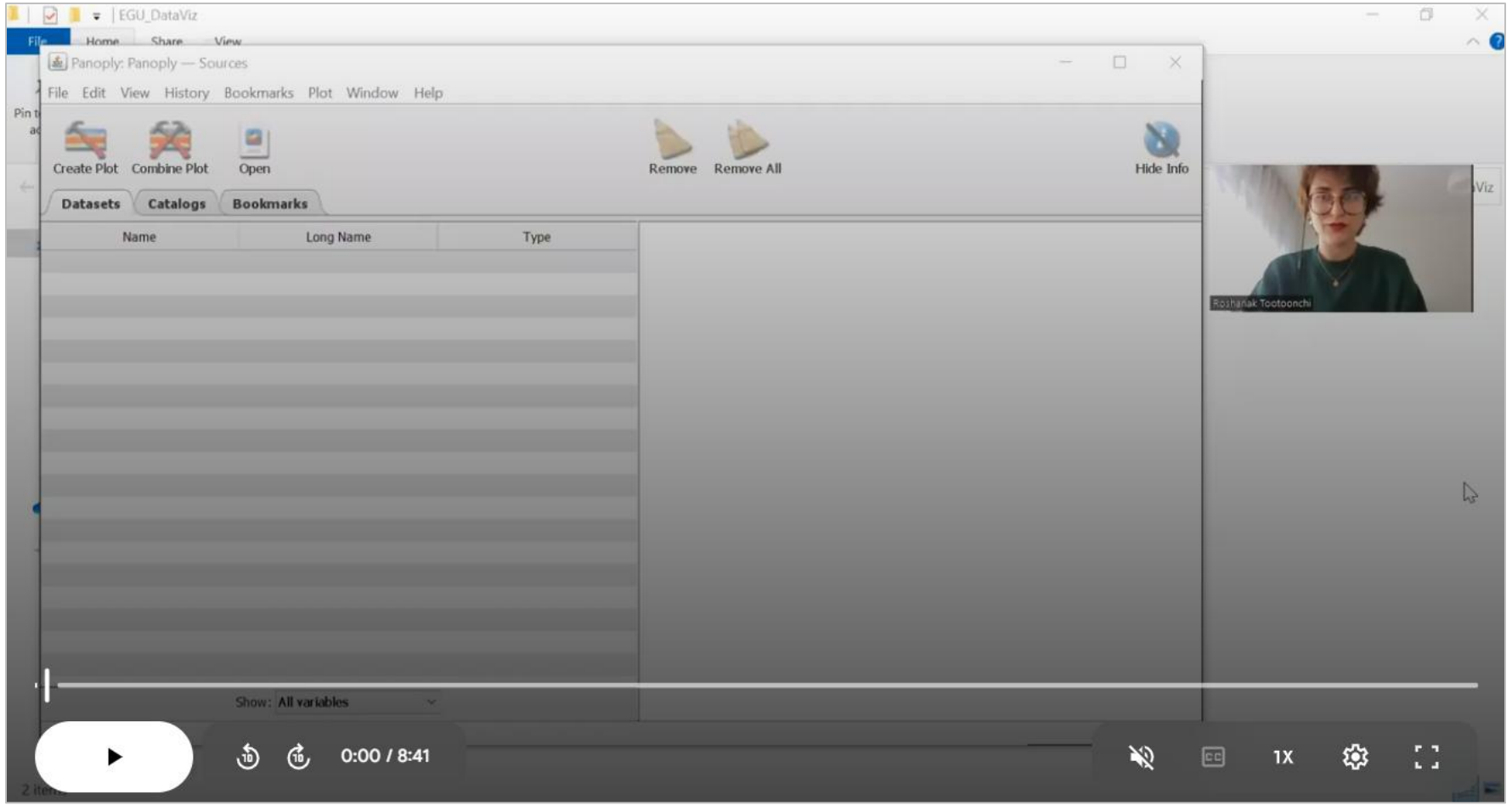
- Create color contour plots of geo-referenced lat-lon, lat-vertical, lon-vertical, time-lat or time-vertical arrays from 2D or larger multi-D variables.
- Create line plots of data from 1D or larger multi-D variables.
- Combine two geo-referenced arrays in one plot by subtracting, summing, averaging, merging, etc.
- Plot lon-lat data on a global or regional map using over 200 map projections or make a zonal average line plot.
- Use numerous color tables for the scale colorbar, or apply your own custom RGB color table.
- Export animations as MP4 video, or collection of individual frames.







Panoply



Video: https://drive.google.com/file/d/1FMbxLGiJssgKlrigJCjiSs6fXGjRPKt7/view

NCAR Command Language (NCL)

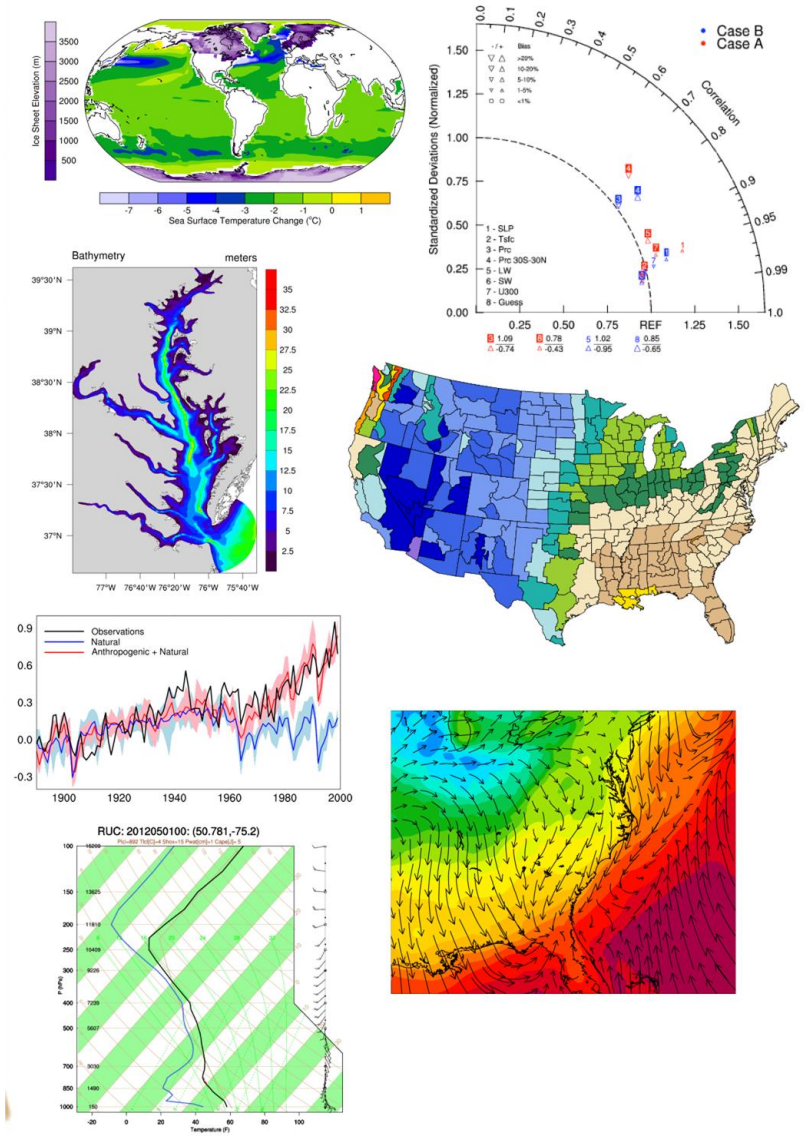
NCL is an interpreted language designed for data analysis and visualization.

NCL is open source! It is available for MacOS, Linux, and Windows systems running the Windows 10 Linux subsystem.

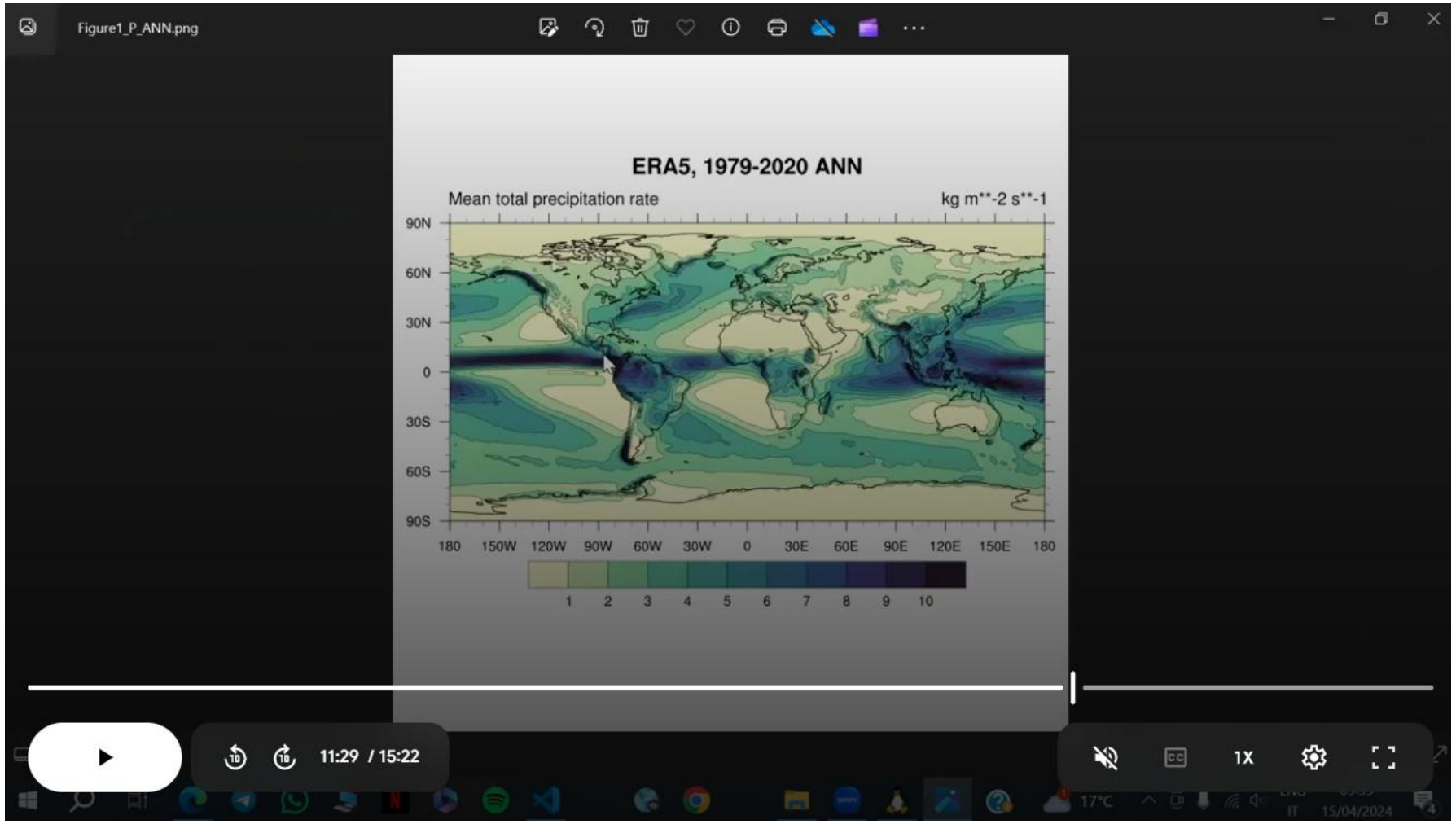
It supports NetCDF, GRIB, Shapefile, etc.

There are a lot of useful built-in functions.

It's got many graphic resources, and high-quality graphics can be created.



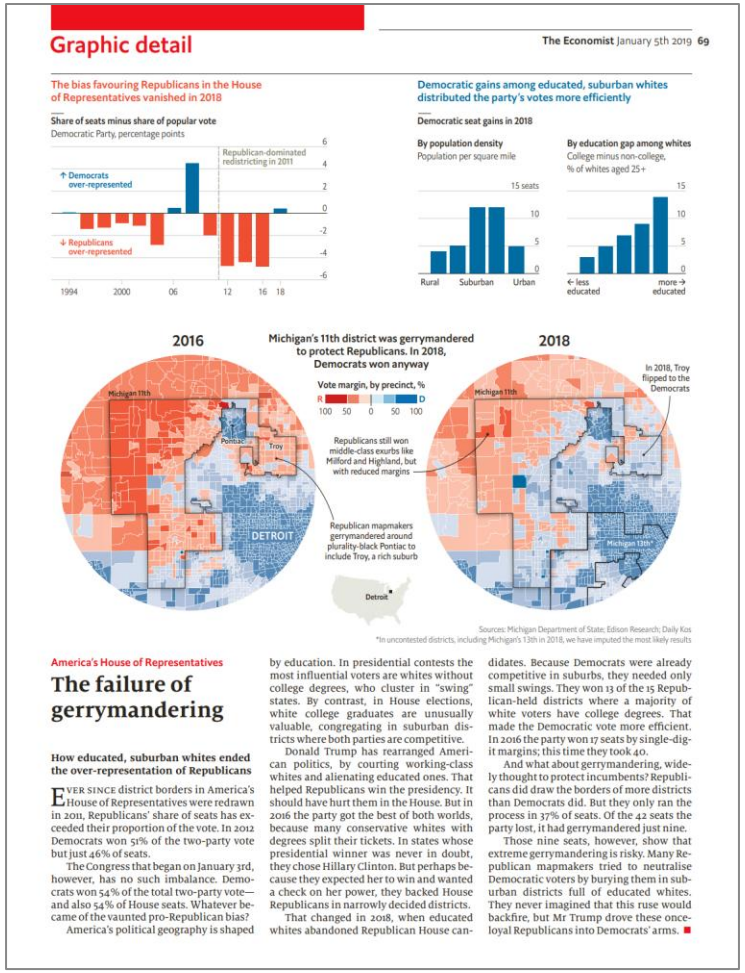
NCAR Command Language (NCL)



Applications and examples: https://www.ncl.ucar.edu/Applications/

Video: https://drive.google.com/file/d/1ktjxWxq4TuL9mTpcjPkm6hHuTezvMxl9/view

Interesting DataViz



Graphic detail

The Economist January 5th 2019 69

The bias favouring Republicans in the House of Representatives vanished in 2018

Share of seats minus share of popular vote
Democratic Party, percentage points

Democratic gains among educated, suburban whites distributed the party's votes more efficiently

Democratic seat gains in 2018

By population density
Population per square mile

By education gap among whites
College minus non-college, % of whites aged 25+

2016 Michigan's 11th district was gerrymandered to protect Republicans. In 2018, Democrats won anyway 2018

Vote margin, by precinct, %

America's House of Representatives

The failure of gerrymandering

How educated, suburban whites ended the over-representation of Republicans

Graphic detail Opinion on Brexit

The Economist February 23rd 2019 93

→ Views on Brexit have barely shifted since 2016, but leavers are split over Theresa May's deal

Remain in the EU 49%

Leave with May's deal 24%

Leave with no deal 27%

Most likely remain supporter

Most likely deal supporter

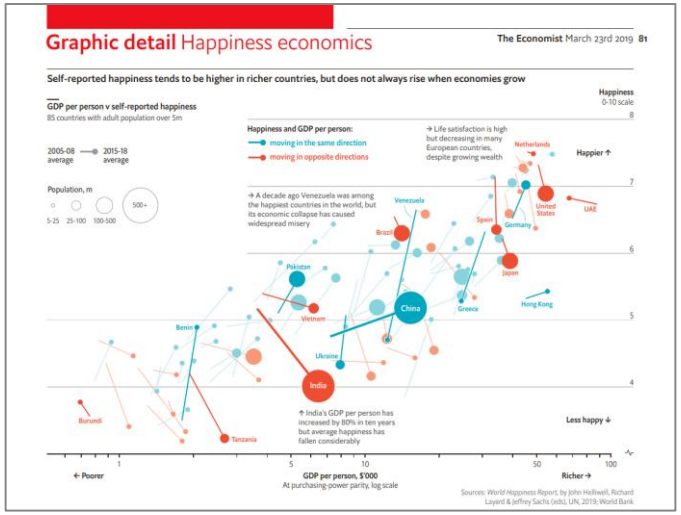
Most likely no-deal supporter

→ Age and education strongly predict current views on remaining in the EU, but not on May's deal versus no deal

→ More politically engaged voters, particularly men, prefer remain or no deal to May's compromise

The centre cannot hold

A polarised electorate has little desire for the government's compromise



Graphic detail Happiness economics

The Economist March 23rd 2019 81

Self-reported happiness tends to be higher in richer countries, but does not always rise when economies grow

GDP per person v self-reported happiness
85 countries with adult population over 5m

SOURCE: https://infographics.economist.com/2019/AChristmasGiftForYou/AYearInGraphicDetail.pdf

Interesting DataViz

SOURCE: https://multimedia.scmp.com/culture/article/SCMP-printed-graphics-memory/

Q&A

Thank you for your attention!

Conveners:
Paola Mazzoglio (Politecnico di Torino, Italy) – paola.mazzoglio@polito.it
Edoardo Martini (University of Leipzig, Germany) - edoardo.martini@uni-leipzig.de
Roshanak Tootoonchi (University of Trento, Italy) - roshanak.tootoonchi@unitn.it
Epari Ritesh Patro (University of Oulu, Finland) – ritesh.patro@oulu.fi
Xinyang Fan (University of Erlangen-Nuremberg, Germany) - xinyang.fan@unibe.ch

Invited speaker:
Fabio Crameri (Undertone.design & ISSI Bern, Switzerland) - fabiocrameri@undertone.design