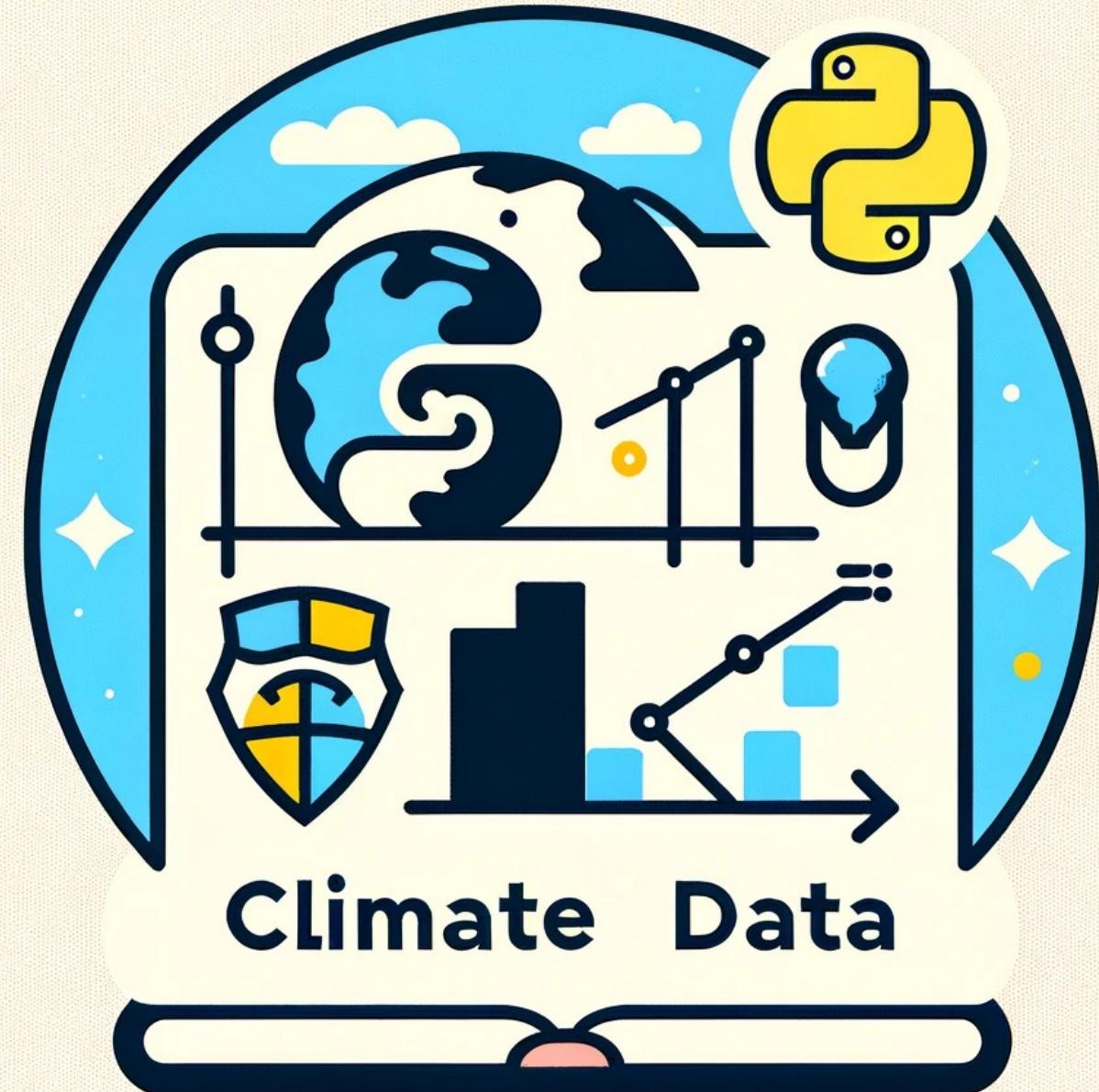


# Climate Data – A hands-on python course

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*Image generated by OpenAI's DALL-E through ChatGPT assistance*

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@ed\_hawkins  
“2023 was the warmest year on record globally by a large margin”

# Climate variables

An [Essential Climate Variable](#) (ECV) is a physical, chemical or biological variable or a group of linked variables that critically contributes to the characterization of Earth's climate (WMO).

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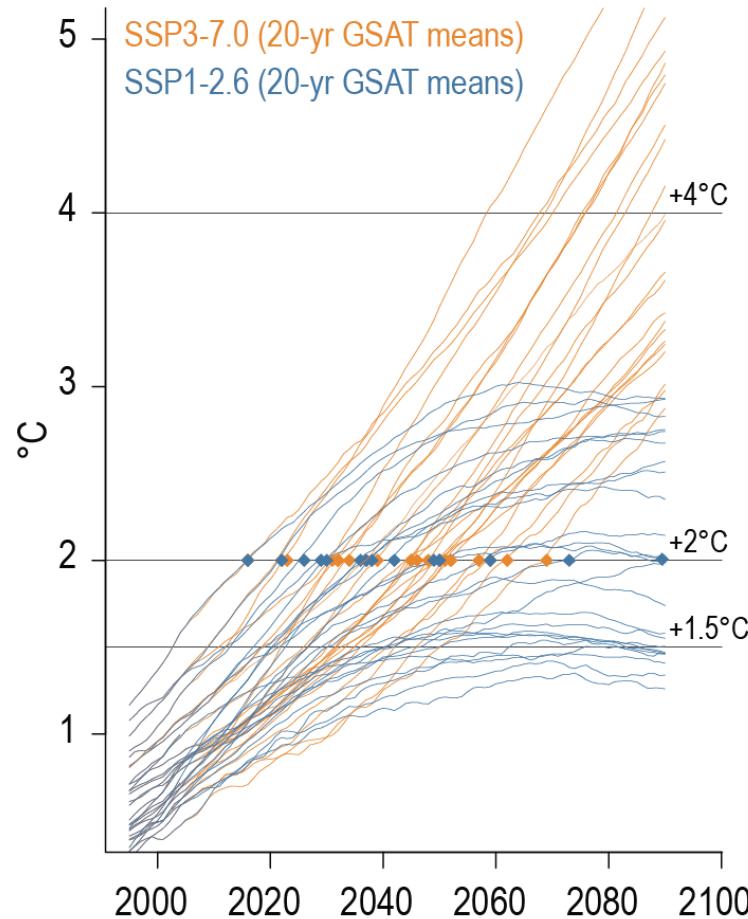
What variables do you know?

13 responses

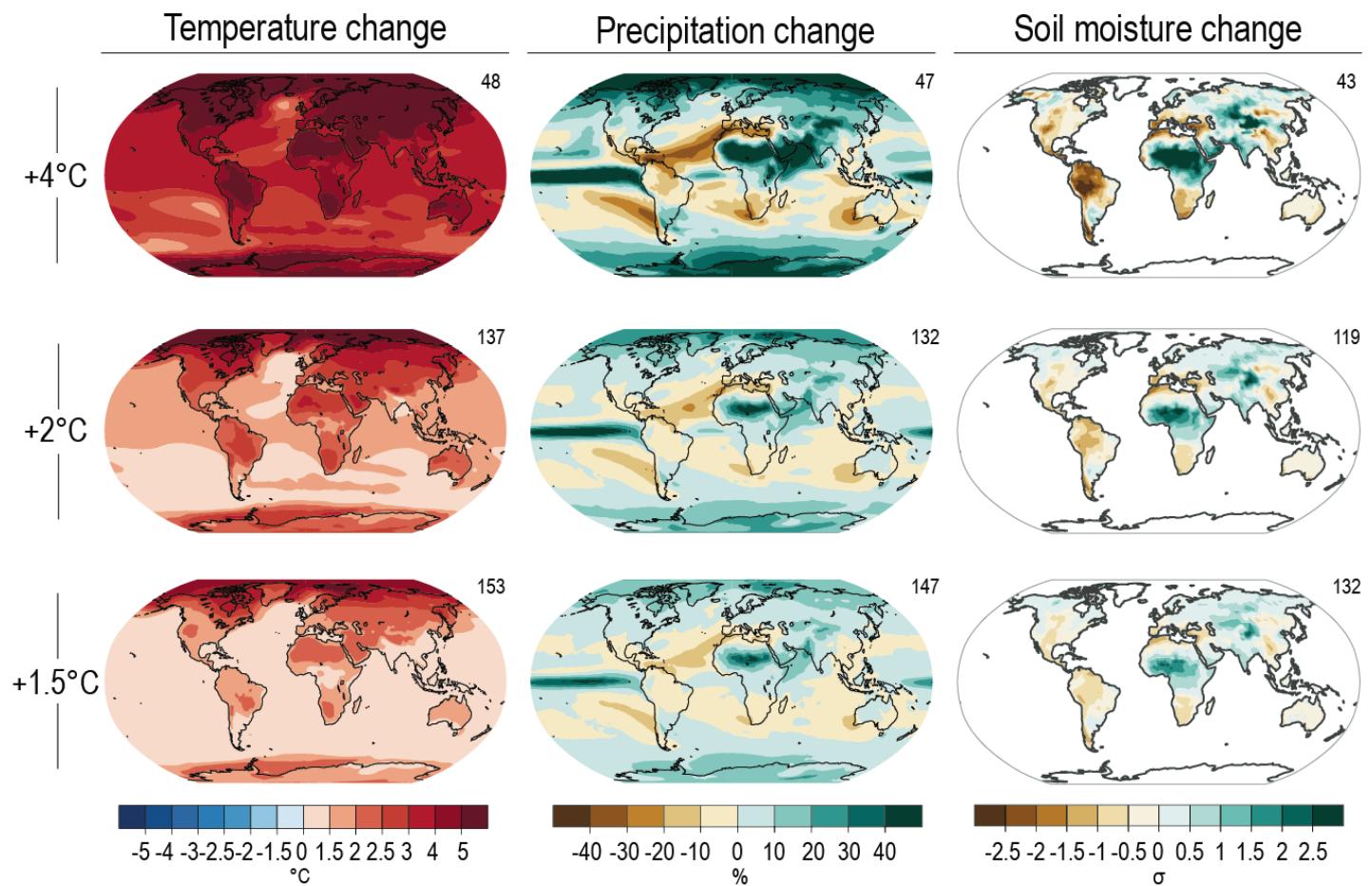


# Why is climate data important?

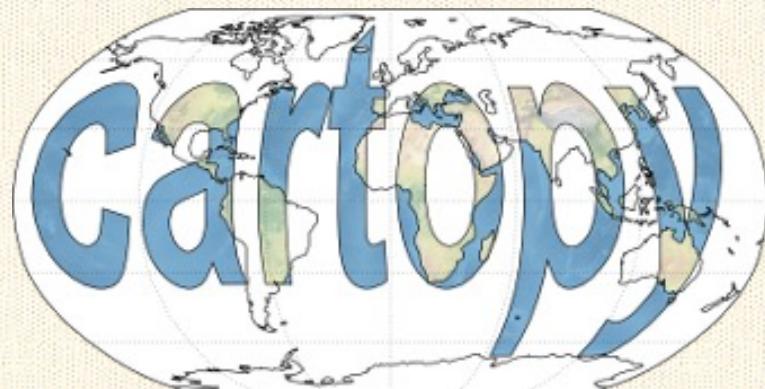
(a) Global mean temperature in CMIP6



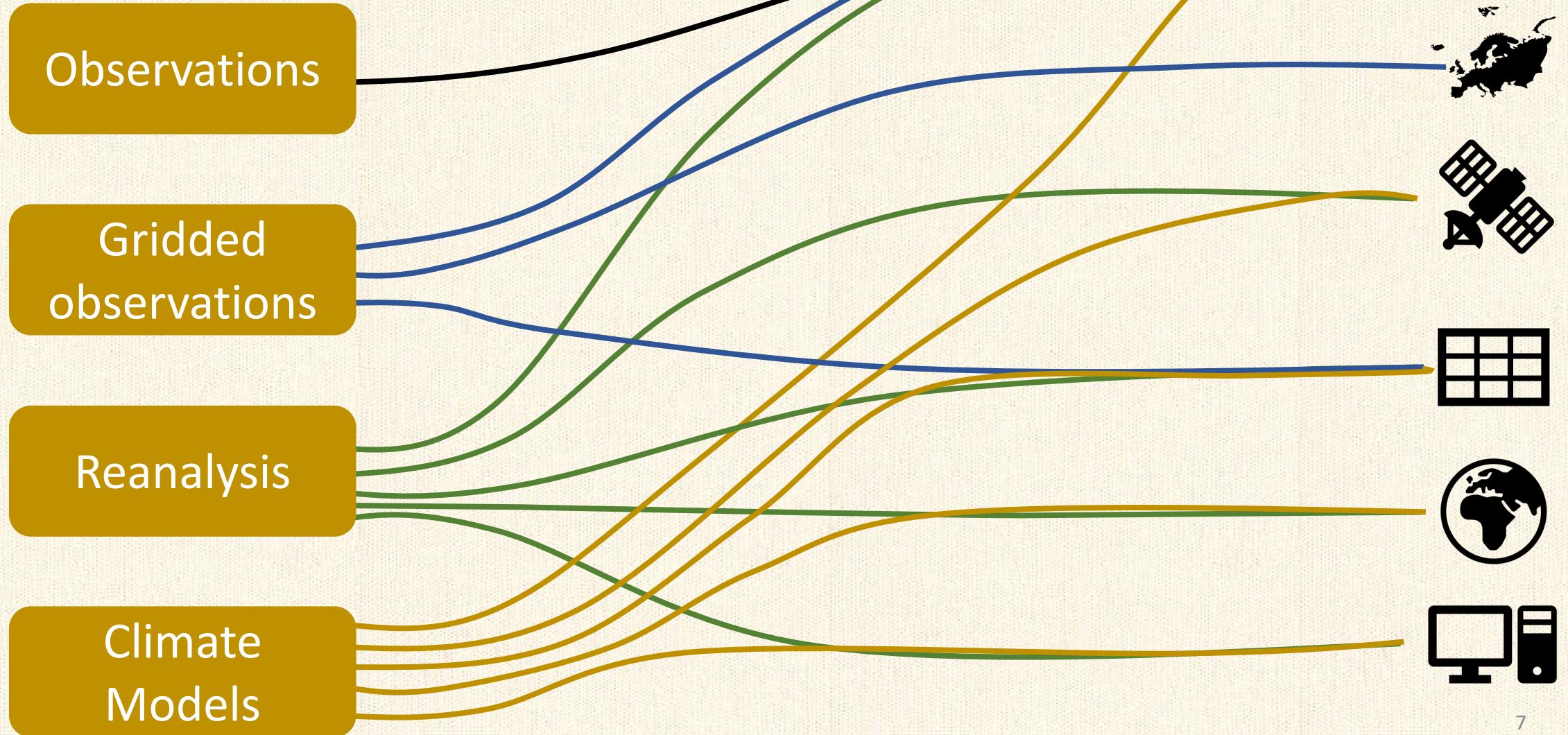
(b) Patterns of change in near-surface air temperature, precipitation and soil moisture



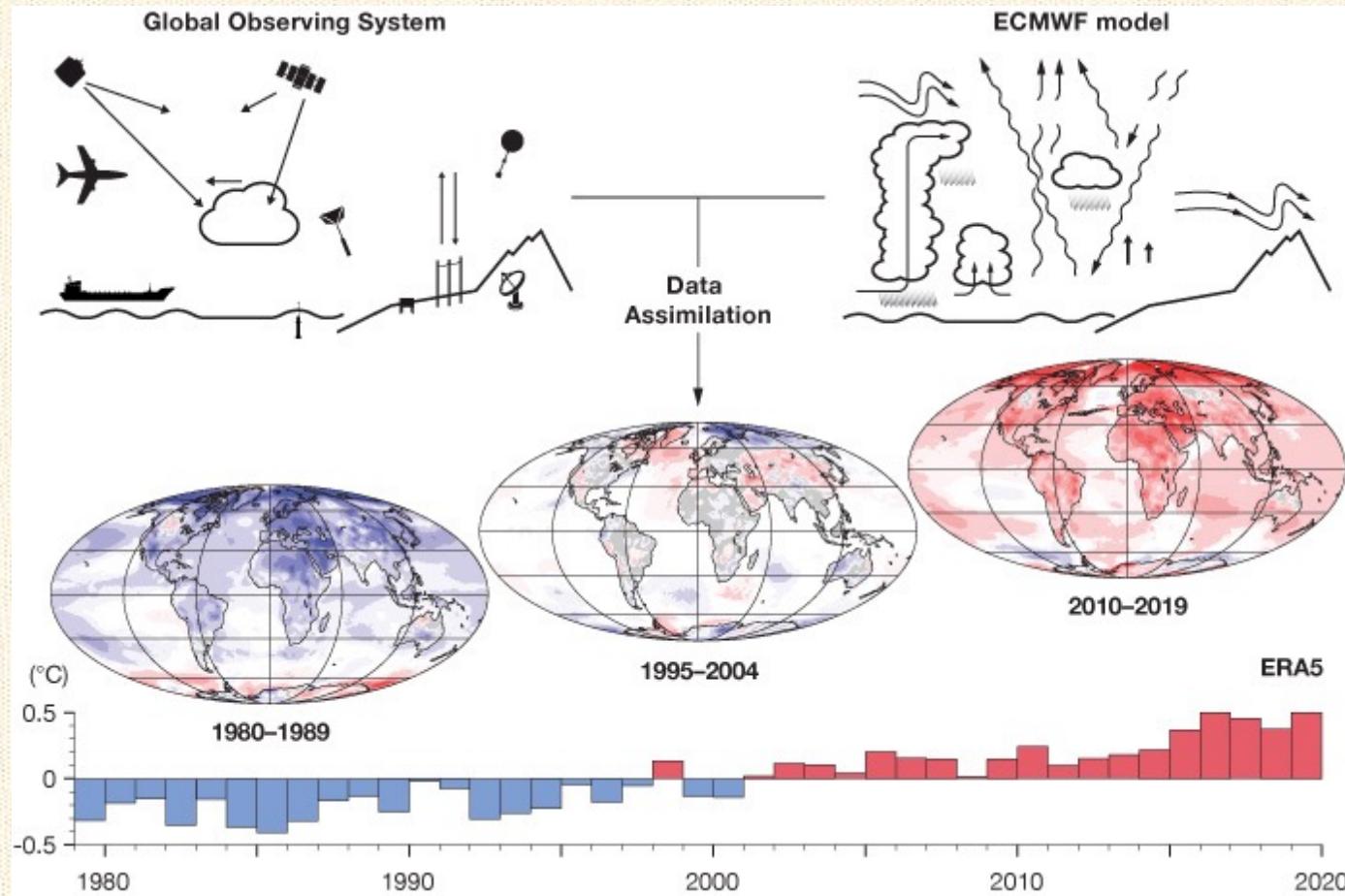
# Python libraries



# Data sources



# Reanalysis

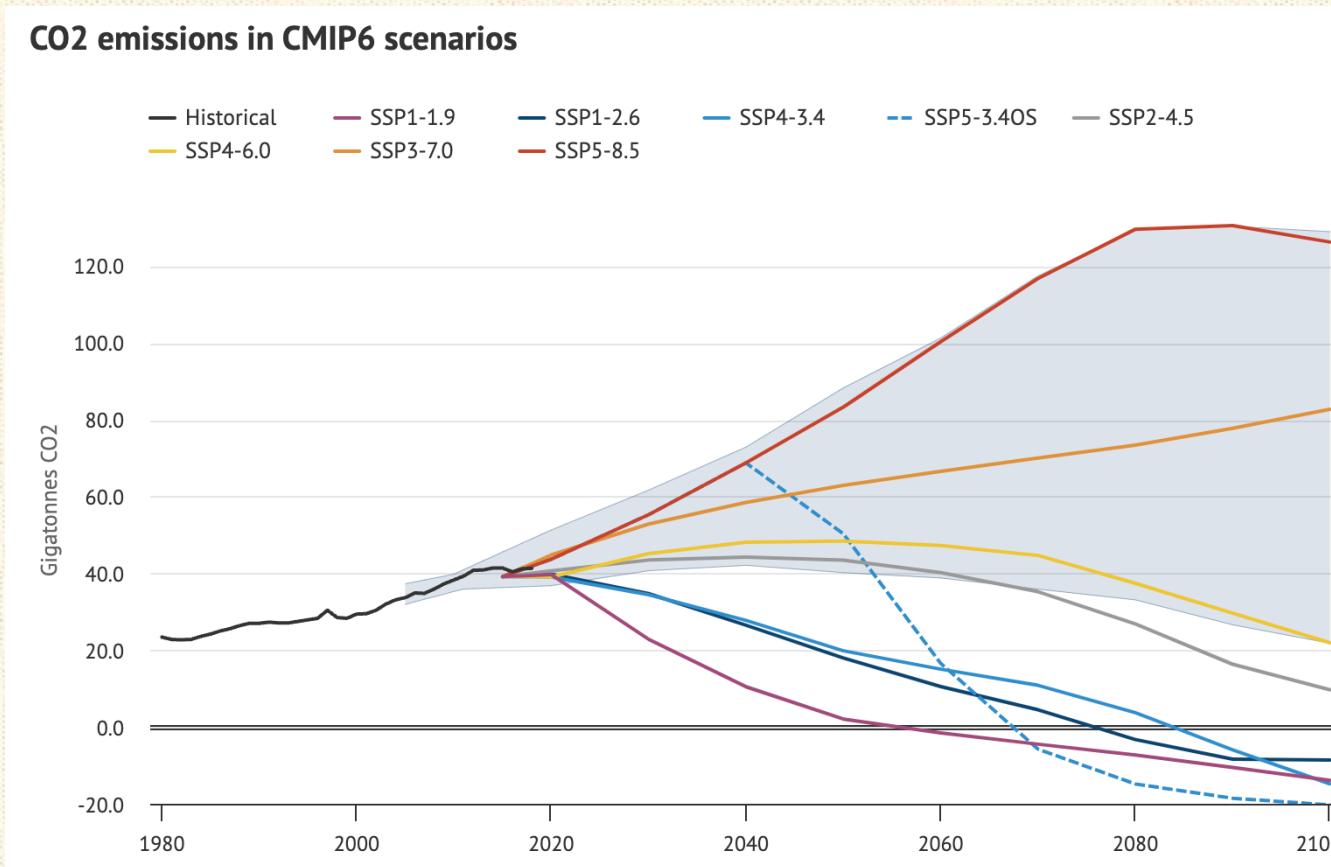


Source: [ECMWF](#)

They provide the closest global picture of past weather and climate by incorporating a vast amount of observational data.

- They are a blend of observations and forecast models.
- Provide homogenous gridded global data.
- Do not contain gaps in time.
- Helpful to understand past weather events and climate.

# Global Climate Models (CMIP6)



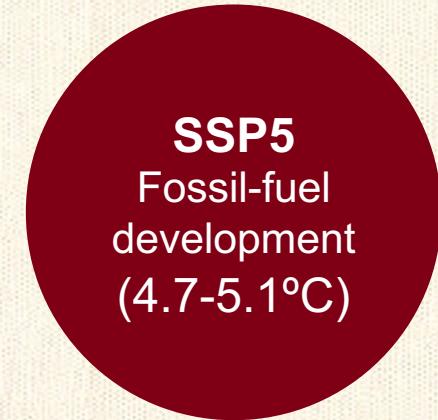
Source: [Carbonbrief](#)

Primary source to understand past climatic changes and the its likely future evolution based on scenarios.

- They do not provide weather forecasts.
- Around 100 climate models.
- 49 different modelling groups.
- Future climate scenarios strongly based on CO<sub>2</sub> emissions.

# The Shared Socioeconomical Pathways (SSPs)

They address how socioeconomic factors may change over the next century that could lead to very different future emissions and warming outcomes, even without climate policy.



Source: [Carbonbrief](#)

# Data sources examples

## Gridded observations

- [E-OBS](#)
- [HadUK](#)

## Reanalysis

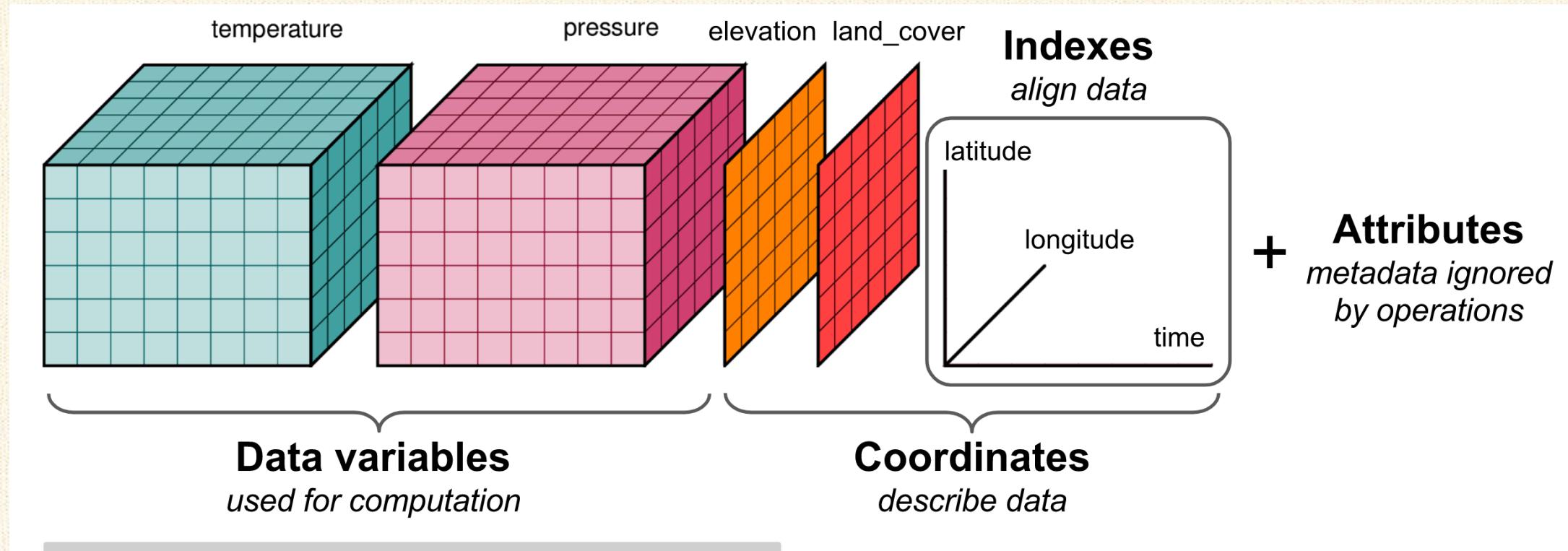
- [ERA5 Reanalysis](#) (1940 to present)
- [NCEP/NCAR](#) Reanalysis (1948 onwards)
- [NOAA 20C](#) (1836-2015)\*
- [JRA-3Q](#) (1947 onwards)

## Climate Models

- [CMIP6](#)
- [CORDEX](#)

\*Only uses mean sea level pressure data

# The NetCDF format



NetCDF (network Common Data Form) it is known as a “self-describing” data structure which means that metadata, or descriptions of the data, are included in the file itself and can be parsed programmatically. The NetCDF format can store data with multiple dimensions. It can also store different types of data through arrays that can contain geospatial imagery, rasters, terrain data, climate data, and text ([EarthLab](#)).

# Hands-on Python



Access the course material HERE:

<https://github.com/PedroLormendez/Climate-Data-A-hands-on-python-course>

A screenshot of a GitHub repository page for "Climate-Data-A-hands-on-python-course". The page shows a list of files and folders: "data", "help\_code", "notebooks", ".DS\_Store", ".gitattributes", ".gitignore", "README.md", and "~\$Introduction.pptx". On the right side, there is a "Clone" section with options for "Local", "HTTPS", "SSH", and "GitHub CLI". Below that is a link to the repository's URL: "https://github.com/PedroLormendez/Climate-Data-A-hands-on-python-course". Further down are links for "Open with GitHub Desktop" and "Download ZIP". A cursor arrow points to the "Download ZIP" button, which is highlighted with a yellow glow. The "Local" tab in the clone section is also highlighted with a blue glow.