Access to Analysis and Climate Indices Tools for Climate Researchers and End Users

with Climate4Impact 2.0a and icclim 5.0-RC1

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I Impacts of Climate Change

2021 Germany Erftstadt, southwest of Cologne

2020 Hurricane Delta causes damage to Louisiana's Gulf Coast

- Urgent needs of impact assessments
- Identify mitigation solutions
- Extreme events attribution
- Multiple domains: infrastructures, urban, agriculture, transportation, etc.
- Flexible tools needed for very diverse users
- Compound Events

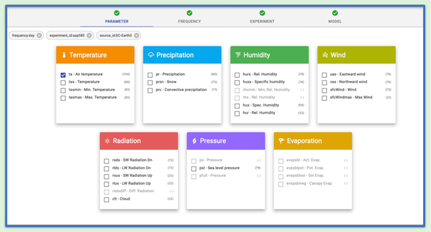
II Common Users' Needs

From Users *Surveys*

- Difficult to deal with the large number of climate simulation datasets
- Lost in which climate model, experiments to use
- Many climate indices are complex to calculate
- Cannot reproduce results easily

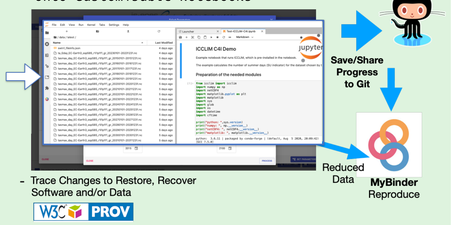
III Climate4Impact 2.0 (C4I)

- GUI usability & Help/Feedback pages
- Flexible analysis features (Notebooks with icclim - Data Staging/Reduction Workflows)
- Automated reproducibility mechanisms and documentation (Data/Analysis)
- Pages for Models Performance Comparison (ESMValTool)
- Modular Deployment & Decoupled Architecture



https://dev.climate4impact.eu

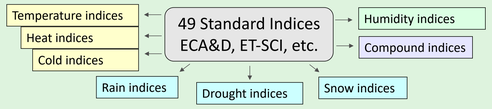
Workflows for data staging & remote subsetting-reduction (WPS) onto Customisable Notebooks



Take Home Messages

1. **Strong Needs for tools to address ensemble of climate change simulations**
2. **icclim is a flexible, robust and fast python software for calculating climate indices**
3. **Provenance & Lineage is very important for reproducibility**
4. **Standards are essential for sharing results**

IV icclim: Climate Indices

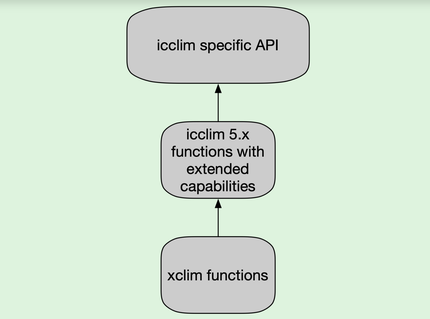


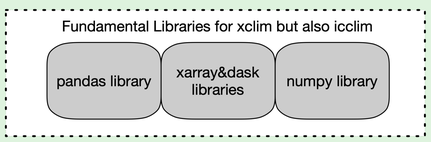
- Intra-period extreme temperature range [° C] - **ETR**
- Warm days (days with mean temperature > 90th percentile of daily mean temperature) - **TG90p**
- Summer days (days with max temperature > 25 ° C) - **SU**
- ...

- Python code developed@Cerfacs since 2013
- Performance optimized
- Fully compliant to CF and Standards
- Validated against climpact & xclim
- Easy install: `pip install icclim`
- Implement the proper percentile indices calculations when calculation period overlaps reference period: bootstrapping method

V icclim (python) Code Architecture

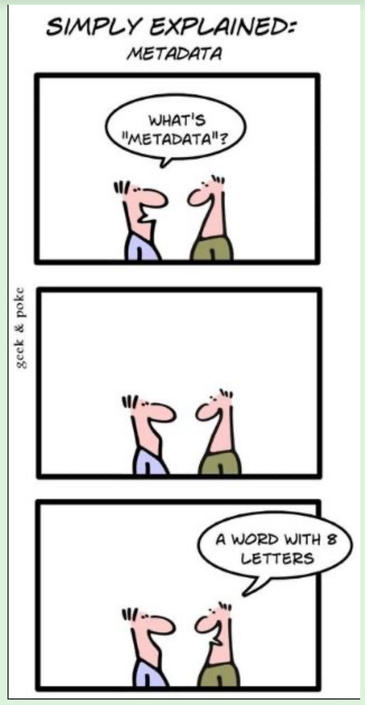
- Using xclim climate indices functions
- xclim functions are using xarray, dask, pandas and numpy: optimized and parallel
- icclim 5 implements a specific API very similar to v4
- Extended capabilities: user-defined indices, user-specific thresholds, etc.





VI Work Plan

- Expand testing of 5.0.0RC versions to more users in order to release 5.0.0
- Implements full support of provenance information (PROV-O)
- Finalize standards for climate indices metadata clix-meta
  `https://github.com/clix-meta/clix-meta`
- Release support tools: testing suite
- Provide more Jupyter Notebooks to include in C4I
  `https://gitlab.com/is-enes-cdi-c4i/notebooks`



IS-ENES: https://is.enes.org/ icclim v5.0.0RC1: https://github.com/cerfacs-globc/icclim (`pip install icclim`) climate4impact 2.0 beta: https://dev.climate4impact.eu/

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https://rebrand.ly/icclim