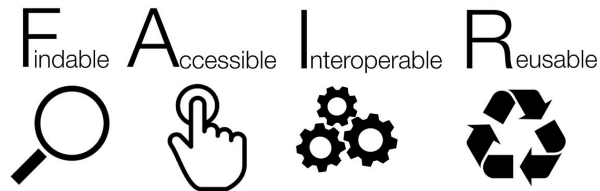


## Climate4Impact v2

Alessandro Spinuso (KMMI)  
& 2RS Team

- **Modular Deployment & Decoupled Services**
- **GUI usability & Help/Feedback pages**
- **Flexible analysis features** (Notebooks, ICCLIM and Data Staging/Reduction Workflows)
- **Automated reproducibility mechanisms and link to Documentation** (Data/Analysis)



- **Model Performance Comparison Functionality** (ESMValTool)

# Climate4Impact (v2) - Search and Nodes

## Interactive Parametrisation made easier

The interface displays the following search filters and results:

**Search Filters:** variable:tas, frequency:day, experiment\_id:dcppA-hindcast, source\_id:CMCC-CM2-SR5, member\_id:r11p1f1

**Temperature**

- tas - Temperature (-)
- tasmin - Min. Temperature (-)
- tasmax - Max. Temperature (-)
- ta - Air temperature (-)

**Precipitation**

- pr - Precipitation (-)
- prc - Convective precipitation (-)
- prsn - Snow (-)

**Humidity**

- huss - Specific humidity (-)
- hurs - Rel. Humidity (-)
- rhsm - Min, Rel. Humidity (-)
- rhs - Rel. Humidity (-)
- hus - Spec. Humidity (-)
- hur - Rel. Humidity (-)

**Wind**

- sfcWind - Wind (-)
- sfcWindmax - Max Wind (-)
- uas - Eastward wind (-)
- vas - Northward wind (-)

**Radiation**

- rsds - SW Radiation Dn (-)
- rsus - SW Radiation Up (-)
- rlds - LW Radiation Dn (-)
- rlus - LW Radiation Up (-)
- rsdsdiff - Diff. Radiation (-)
- clt - Cloud (-)

**Pressure**

- ps - Pressure (-)
- psl - Sea level pressure (-)
- pfull - Pressure (-)

**Evaporation**

- evspsbl - Act. Evap. (-)
- evspsblpot - Pot. Evap. (-)
- evspsblsoli - Sol Evap. (-)
- evspsblveg - Canopy Evap. (-)

# Climate4Impact (v2) - Search and Nodes

## Interactive Parametrisation made easier

The screenshot shows the 'is-enes Exploring climate model data' interface. The top navigation bar includes 'Home', 'Data Discovery', 'Help', 'Feedback', and 'Sign Up'. Below the navigation, the user is logged in as 'aspinuso'. The main content area displays search filters for 'PROJECT: CMIP 6' and 'NODES: ALL'. A sidebar on the left lists categories: VARIABLE, FREQUENCY, EXPERIMENT, MODEL, and MEMBER. The main area features four interactive panels for parametrisation:

- Temperature** (orange header):
  - tas - Temperature (-)
  - tasmin - Min. Temperature (-)
  - tasmax - Max. Temperature (-)
  - ta - Air temperature (-)
- Precipitation** (blue header):
  - pr - Precipitation (-)
  - prc - Convective precipitation (-)
  - prsn - Snow (-)
- Radiation** (red header):
  - rsds - SW Radiation Dn (-)
  - rsus - SW Radiation Up (-)
  - rlds - LW Radiation Dn (-)
  - rlus - LW Radiation Up (-)
  - rsdsdiff - Diff. Radiation (-)
  - clt - Cloud (-)
- Pressure** (purple header):
  - ps - Pressure
  - psl - Sea level pressure
  - pfull - Pressure

## Nodes Selection by Service

The screenshot shows the 'is-enes Exploring climate model data' interface with the 'Available ESGF Nodes' dialog box open. The dialog box has a title bar 'Available ESGF Nodes' and a close button. It contains a checkbox 'Select & enable Rook WPS subsetting' which is checked. Below this is a table of nodes with columns for 'Node' and 'Subsetting Mode'.

Node	Subsetting Mode
<input checked="" type="checkbox"/> esgf1.dkrz.de	Rook WPS
<input checked="" type="checkbox"/> esgf3.dkrz.de	Rook WPS
<input type="checkbox"/> aims3.llnl.gov	Opendap
<input type="checkbox"/> cmip.dess.tsinghua.edu.cn	Opendap
<input type="checkbox"/> cmip.fio.org.cn	Opendap
<input type="checkbox"/> cordexesg.dmi.dk	Opendap
<input type="checkbox"/> crd-esgf-drc.ec.gc.ca	Opendap
<input type="checkbox"/> data.meteo.unican.es	Opendap
<input type="checkbox"/> dataserver.nccs.nasa.gov	Opendap
<input type="checkbox"/> dpegf03.nccs.nasa.gov	Opendap
<input type="checkbox"/> esg-cccr.tropmet.res.in	Opendap

At the bottom of the dialog box is an 'OK' button. The background interface shows the same search and nodes interface as the previous screenshot, with the 'Temperature' panel selected.

# Climate4Impact (v2) Workflows & Workspaces

Climate4Impact Search for CMIP5/6  
CORDEX Data (Distributed Data)

<https://dev.climate4impact.eu>

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

The screenshot shows the search interface with filters for PARAMETER, FREQUENCY, EXPERIMENT, and MODEL. The search criteria are: frequency.day, experiment\_id:asp585, and source\_id:EC-Earth3. The results are categorized into several groups:

- Temperature:** ta - Air temperature (104), tas - Temperature (90), tasmin - Min. Temperature (81), tasmx - Max. Temperature (81).
- Precipitation:** pr - Precipitation (90), prsn - Snow (72), prc - Convective precipitation (71).
- Humidity:** hurs - Rel. Humidity (79), huss - Specific humidity (74), rhsm - Min. Rel. Humidity (-), rhsl - Rel. Humidity (-), hus - Spec. Humidity (54), hur - Rel. Humidity (22).
- Wind:** uas - Eastward wind (74), vas - Northward wind (74), sfcWind - Wind (72), sfcWindmax - Max Wind (31).
- Radiation:** rsds - SW Radiation Dn (72), rlds - LW Radiation Dn (72), rsus - SW Radiation Up (22), rlus - LW Radiation Up (22), rsdsdiff - Diff. Radiation (-), clt - Cloud (22).
- Pressure:** ps - Pressure (-), psl - Sea level pressure (79), pfull - Pressure (-).
- Evaporation:** evspsbl - Act. Evap. (-), evspsblpot - Pot. Evap. (-), evspsblsol - Sol Evap. (-), evspsblveg - Canopy Evap. (-).

The 'Select Parameters' dialog box is shown with the following settings:

- Operation Selection:** Operation to be used for rook subsetting. Options: Average (selected), No Op.
- Spatial Parameters:** Coordinates of the bounding box in lat / lon format. Min. Latitude: -90.0, Max. Latitude: 90.0, Min. Longitude: -180.0, Max. Longitude: 180.0.
- Temporal Parameters:** Full years or specific dates in advanced mode. Start year: 2015, End year: 2100.

Buttons: CLOSE, PROCESS, SET PARAMETERS.

# Climate4Impact (v2) Workflows & Workspaces

Climate4Impact Search for CMIP5/6  
CORDEX Data (Distributed Data)

<https://dev.climate4impact.eu>

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

The screenshot shows a search interface with filters for PARAMETER, FREQUENCY, EXPERIMENT, and MODEL. The PARAMETER filter is expanded to show several categories:

- Temperature:** ta - Air Temperature (104), tas - Temperature (90), tasmin - Min. Temperature (81), tasmax - Max. Temperature (81).
- Precipitation:** pr - Precipitation (90), prsn - Snow (72), prc - Convective precipitation (71).
- Humidity:** hurs - Rel. Humidity (79), huss - Specific humidity (74), rhsm - Min. Rel. Humidity (-), rths - Rel. Humidity (-), hus - Spec. Humidity (54), hur - Rel. Humidity (22).
- Wind:** uas - Eastward wind (74), vas - Northward wind (74), sfcWind - Wind (72), sfcWindmax - Max Wind (31).
- Radiation:** rsds - SW Radiation Dn (72), rlds - LW Radiation Dn (72), rsus - SW Radiation Up (22), rlus - LW Radiation Up (22), rsdldiff - Diff. Radiation (-), clt - Cloud (22).
- Pressure:** ps - Pressure (-), psl - Sea level pressure (79), pfull - Pressure (-).
- Evaporation:** evspsbl - Act. Evap. (-), evspsblpot - Pot. Evap. (-), evspsblsol - Sol Evap. (-), evspsblveg - Canopy Evap. (-).

The screenshot shows a Jupyter Notebook interface with a file explorer on the left and a code cell on the right. The file explorer shows a directory structure with files like 'swirl\_fileinfo.json' and various data files. The code cell contains the following Python code:

```
[1]: from icclim import icclim
import numpy as np
import netCDF4
import matplotlib.pyplot as plt
import matplotlib
import sys
import glob
import os
import datetime
import cftime

print("python: ", sys.version)
print("numpy: ", np.__version__)
print("netCDF4: ", netCDF4.__version__)
print("matplotlib: ", matplotlib.__version__)

python: 3.6.11 | packaged by conda-forge | (default, Aug 5 2020, 20:09:42)
[CC 7.5.0]
```



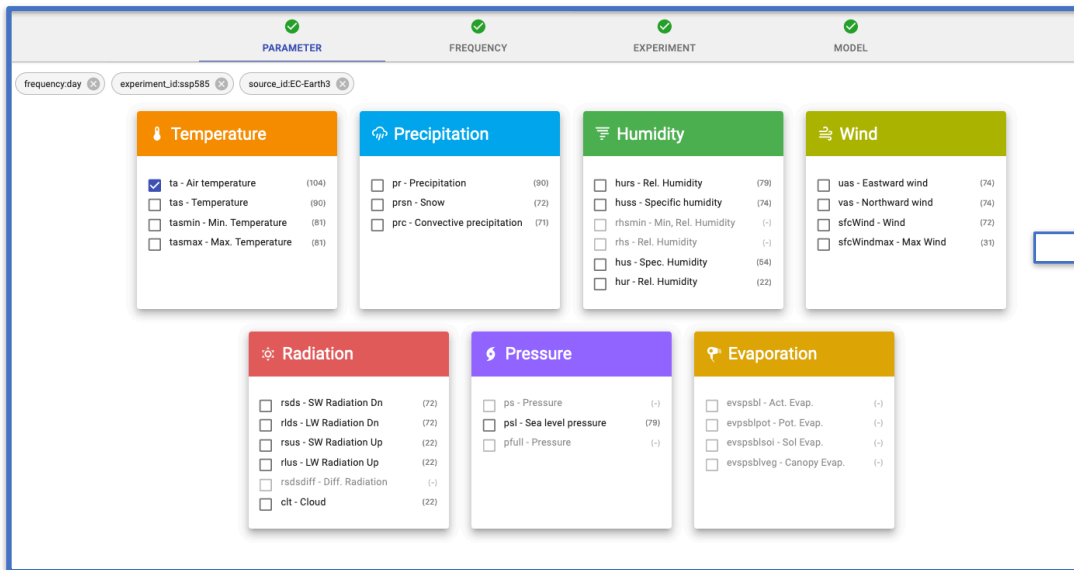
Save Progress  
to Git

# Climate4Impact (v2) Workflows & Workspaces

Climate4Impact Search for CMIP5/6 CORDEX Data (Distributed Data)

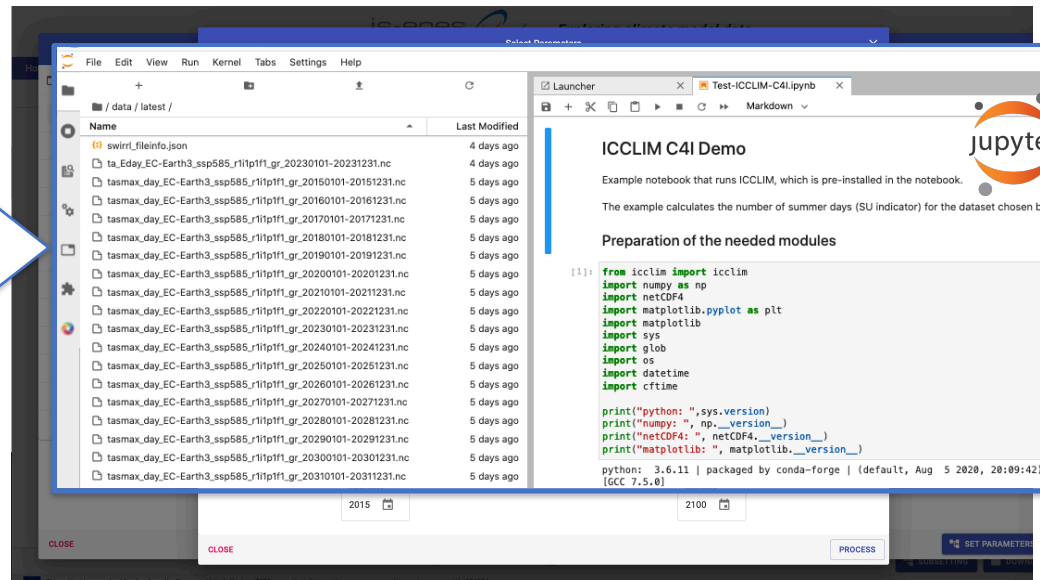
<https://dev.climate4impact.eu>

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



The screenshot shows a search interface with filters for PARAMETER, FREQUENCY, EXPERIMENT, and MODEL. It displays several categories of parameters with checkboxes and counts:

- Temperature:** ta - Air Temperature (104), tas - Temperature (90), tasmin - Min. Temperature (81), tasmax - Max. Temperature (81)
- Precipitation:** pr - Precipitation (90), prsn - Snow (72), prc - Convective precipitation (71)
- Humidity:** hurs - Rel. Humidity (79), huss - Specific humidity (74), rhsm - Min. Rel. Humidity (-), rths - Rel. Humidity (-), hus - Spec. Humidity (54), hur - Rel. Humidity (22)
- Wind:** uas - Eastward wind (74), vas - Northward wind (74), sfcWind - Wind (72), sfcWindmax - Max Wind (31)
- Radiation:** rsds - SW Radiation Dn (72), rlds - LW Radiation Dn (72), rsus - SW Radiation Up (22), rlus - LW Radiation Up (22), rsdldiff - Diff. Radiation (-), clt - Cloud (22)
- Pressure:** ps - Pressure (-), psl - Sea level pressure (79), pfull - Pressure (-)
- Evaporation:** evspsbl - Act. Evap. (-), evspsblpot - Pot. Evap. (-), evspsblsol - Sol Evap. (-), evspsblveg - Canopy Evap. (-)



The screenshot shows a Jupyter Notebook interface with a file browser on the left and a code editor on the right. The code in the notebook is as follows:

```
from icclim import icclim
import numpy as np
import netCDF4
import matplotlib.pyplot as plt
import matplotlib
import sys
import glob
import os
import datetime
import cftime

print("python: ", sys.version)
print("numpy: ", np.__version__)
print("netCDF4: ", netCDF4.__version__)
print("matplotlib: ", matplotlib.__version__)

python: 3.6.11 | packaged by conda-forge | (default, Aug 5 2020, 20:09:42)
[CC 7.5.0]
```



Save Progress to Git

- Trace Changes to Restore, Recover Software and/or Data

# Climate4Impact (v2) Workflows & Workspaces

Climate4Impact Search for CMIP5/6  
CORDEX Data (Distributed Data)

<https://dev.climate4impact.eu>

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

The screenshot shows a search interface with four tabs: PARAMETER, FREQUENCY, EXPERIMENT, and MODEL. The PARAMETER tab is active, displaying a grid of parameter categories with checkboxes and counts:

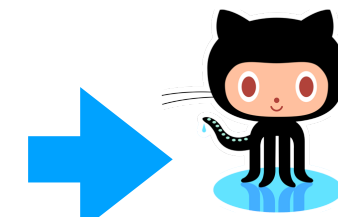
- Temperature:** ta - Air Temperature (104), tas - Temperature (90), tasmin - Min. Temperature (81), tasmax - Max. Temperature (81)
- Precipitation:** pr - Precipitation (90), prsn - Snow (72), prc - Convective precipitation (71)
- Humidity:** hurs - Rel. Humidity (79), huss - Specific humidity (74), rhsm - Min. Rel. Humidity (-), rths - Rel. Humidity (-), hus - Spec. Humidity (54), hur - Rel. Humidity (22)
- Wind:** uas - Eastward wind (74), vas - Northward wind (74), sfcWind - Wind (72), sfcWindmax - Max Wind (31)
- Radiation:** rsds - SW Radiation Dn (72), rlds - LW Radiation Dn (72), rsus - SW Radiation Up (22), rlus - LW Radiation Up (22), rsdldiff - Diff. Radiation (-), clt - Cloud (22)
- Pressure:** ps - Pressure (-), psl - Sea level pressure (79), pfull - Pressure (-)
- Evaporation:** evspsbl - Act. Evap. (-), evspsblpot - Pot. Evap. (-), evspsblsol - Sol Evap. (-), evspsblveg - Canopy Evap. (-)

The screenshot shows a Jupyter Notebook interface with a file browser on the left and a code cell on the right. The file browser displays a list of files with names like 'swirl\_fileinfo.json' and 'tasmax\_day\_EC-Earth3\_ssp585\_r11p1f1\_gr\_20230101-20231231.nc'. The code cell contains the following Python code:

```
from icclim import icclim
import numpy as np
import netCDF4
import matplotlib.pyplot as plt
import matplotlib
import sys
import glob
import os
import datetime
import cftime

print("python: ", sys.version)
print("numpy: ", np.__version__)
print("netCDF4: ", netCDF4.__version__)
print("matplotlib: ", matplotlib.__version__)

python: 3.6.11 | packaged by conda-forge | (default, Aug 5 2020, 20:09:42)
[[CC 7.5.0]]
```



Save Progress  
to Git



Reduced  
Data  
MyBinder  
Reproduce

- Trace Changes to Restore, Recover  
Software and/or Data



# Notebook Presets based on ICCLIM

**Workflow Monitoring**

**GitHub Authentication**

**Snapshot Controls**

**Data Staging Rollback**

**Activities History and Provenance**

The screenshot displays the JupyterLab interface with several panels on the left and a main workspace on the right. The left sidebar contains a vertical menu with icons for workflow monitoring, GitHub authentication, snapshot controls, data staging, and activities history. The main workspace is divided into a code editor and a terminal. The code editor shows Python code for plotting summer days, and the terminal shows the output of the code, including a contour plot of Europe.

```
# Contour filled colors
p = su_avg.plot.contourf(levels=levels,
                        cmap='RdBu_r',
                        extend='both',
                        transform=ccrs.PlateCarree())

# Plot information
plt.suptitle("Two Time Steps of Europe Summer Days", y=1)

# Add the coastlines to axis and set extent
ax.coastlines()
ax.gridlines()
ax.set_extent(extent)

# Save plot as png
plt.savefig('c4i_su_contours_icclim.png')
```

Two Time Steps of Europe Summer Days  
height = 2.0, spatial\_ref = 0

Summer days (number of days where temperature > 25 degrees) [days]

Type	Created at	Action
Library Update	2021-06-15 16:00	RESTORE
pip install xarray		
Workflow	2021-06-09 12:51	
Workflow	2021-06-09 12:31	
Workflow	2021-06-09 12:17	
Snapshot	2021-06-09 10:39	OPEN

# Notebook Presets based on ICCLIM

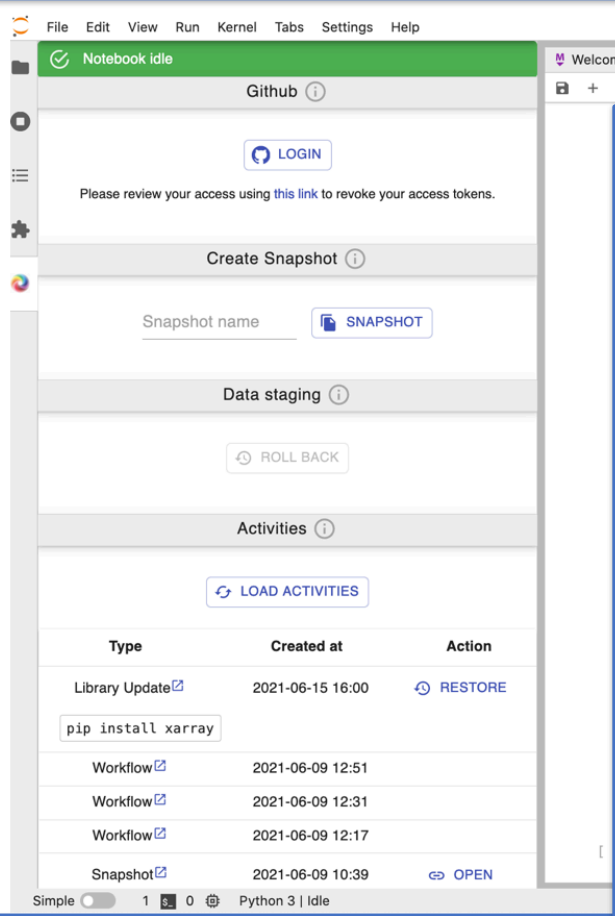
Workflow Monitoring

GitHub Authentication

Snapshot Controls

Data Staging Rollback

Activities History and Provenance



File Edit View Run Kernel Tabs Settings Help

Notebook idle

Github

LOGIN

Please review your access using [this link](#) to revoke your access tokens.

Create Snapshot

Snapshot name

Data staging

Activities

Type	Created at	Action
Library Update	2021-06-15 16:00	<input type="button" value="RESTORE"/>
<code>pip install xarray</code>		
Workflow	2021-06-09 12:51	
Workflow	2021-06-09 12:31	
Workflow	2021-06-09 12:17	
Snapshot	2021-06-09 10:39	<input type="button" value="OPEN"/>

Simple 1 0 Python 3 | Idle

IS-ENES Climate Data Infrastructure for Climate 4 Impact > C4I Use Cases as Jupyter Notebooks

## C4I Use Cases as Jupyter Notebooks

Project ID: 25761638 [Request Access](#)

0  2

13 Commits 1 Branch 0 Tags 1.5 MB Files 1.5 MB Storage

A collection of Jupyter Notebooks implementing some Use Cases.

master notebooks /

Some small fixes. Added deltaT\_deltaP Notebook. Tested also with icclim v5.0.0-b3.

Christian Page authored 2 days ago

Name	Last commit	Last update
<a href="#">C4I_Averaged_Temperature_An...</a>	Some small fixes. Added deltaT_deltaP Not...	2 days ago
<a href="#">C4I_Summer_days_Calculate_...</a>	Some small fixes. Added deltaT_deltaP Not...	2 days ago
<a href="#">C4I_deltaT_deltaP_Anomaly_20...</a>	Some small fixes. Added deltaT_deltaP Not...	2 days ago
<a href="#">README.md</a>	small readme and notebook edits	4 months ago

<https://gitlab.com/is-enes-cdi-c4i/notebooks>

# SWIRRL-API

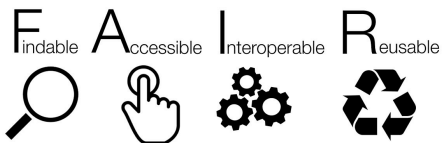


SWIRRL hides the complexity of orchestrating Workspaces in a target **Cloud resource based on Kubernetes Cluster**

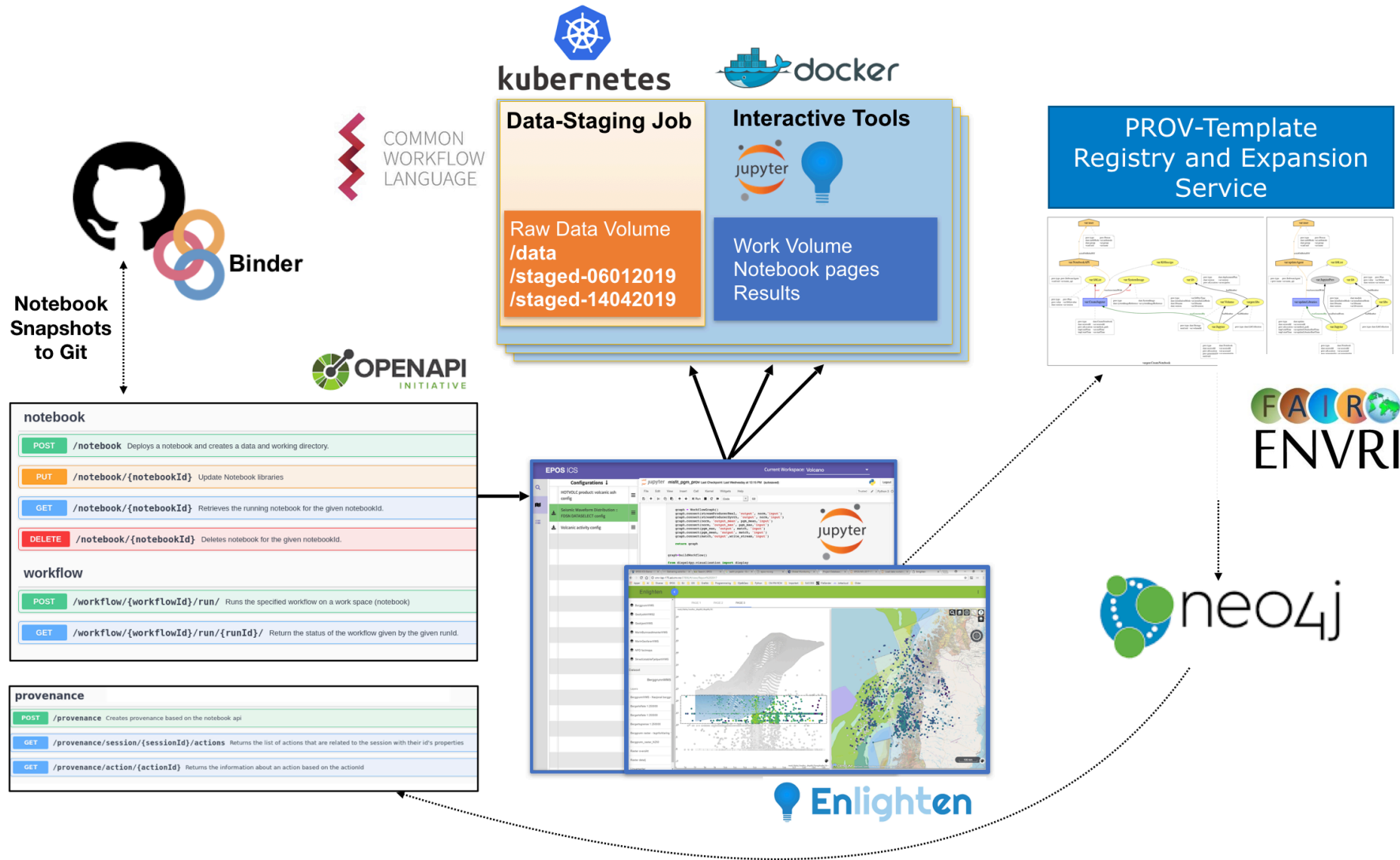
**Integrates Interactive Tools** (Notebooks, Workflows, GIT, Binder)

**Offers a REST Web API**

**Manages Metadata (Provenance)**



**Supports Reproducibility**



# ESMValTool in C4I

## Models' Performance Comparison

The screenshot displays the is-enes web application interface. At the top, the logo and tagline "Exploring climate model data" are visible. Below the navigation bar, the current project is "CMIP 6" and nodes are "CUSTOM (2)". A "SCOPED VIEW" toggle is present. The left sidebar shows filters for VARIABLE, FREQUENCY, EXPERIMENT, MODEL, and MEMBER, with "MODEL" selected. The main content area shows a list of models with checkboxes and counts. The selected models are CaneSM5 - CanESM5, CNRM-CM6-1 - CNRM-CM6-1, and MIROC6 - MIROC6. A "COMPARE MODEL PERFORMANCE" button is located at the bottom of the model list.

Model	Count
<input checked="" type="checkbox"/> CaneSM5 - CanESM5	(57)
<input type="checkbox"/> MPI-ESM1-2-LR - MPI-ESM1.2-LR	(50)
<input type="checkbox"/> UKESM1-0-LL - UKESM1.0-N96ORCA1	(20)
<input checked="" type="checkbox"/> CNRM-CM6-1 - CNRM-CM6-1	(17)
<input checked="" type="checkbox"/> MIROC6 - MIROC6	(10)
<input type="checkbox"/> CNRM-ESM2-1 - CNRM-ESM2-1	(9)
<input type="checkbox"/> MRI-ESM2-0 - MRI-ESM2.0	(7)
<input type="checkbox"/> GFDL-CM4 - GFDL-CM4	(6)
<input type="checkbox"/> HadGEM3-GC31-LL - HadGEM3-GC3.1-N96ORCA1	(6)
<input type="checkbox"/> MPI-ESM1-2-HR - MPI-ESM1.2-HR	(6)
<input type="checkbox"/> INM-CM4-8 - INM-CM4-8	(5)
<input type="checkbox"/> INM-CM5-0 - INM-CM5-0	(5)
<input type="checkbox"/> ACCESS-CM2 - Australian Community Climate and Earth System Simulator Climate Model Version 2	(4)
<input type="checkbox"/> AWI-CM-1-1-MR - AWI-CM 1.1 MR	(4)
<input type="checkbox"/> NorESM2-LM - NorESM2-LM (low atmosphere-medium ocean resolution, GHG concentration driven)	(4)
<input type="checkbox"/> BCC-CSM2-MR - BCC-CSM 2 MR	(3)
<input type="checkbox"/> CMCC-CM2-SR5 - CMCC-CM2-SR5	(3)
<input type="checkbox"/> EC-Earth S-p3 - EC-Earth S-p3	(2)

[COMPARE MODEL PERFORMANCE](#)

# ESMValTool in C4I

## Models' Performance Comparison

The screenshot shows the ESMValTool web interface. At the top, there is a navigation bar with 'Home', 'Data Discovery', 'Help', 'Feedback', and 'Sign Up'. Below this, the current project is 'PROJECT: CMIP 6' and nodes are 'NODES: CUSTOM (2)'. A sidebar on the left has tabs for 'VARIABLE', 'FREQUENCY', 'EXPERIMENT', 'MODEL', and 'MEMBER', with 'MODEL' currently selected. The main content area displays a list of models under the heading 'Model'. The following table represents the visible model selection options:

Model Name	Selected
<input checked="" type="checkbox"/> CanESM5 - CanESM5	Yes
<input type="checkbox"/> MPI-ESM1-2-LR - MPI-ESM1.2-LR	No
<input type="checkbox"/> UKESM1-0-LL - UKESM1.0-N96ORCA1	No
<input checked="" type="checkbox"/> CNRM-CM6-1 - CNRM-CM6-1	Yes
<input checked="" type="checkbox"/> MIROC6 - MIROC6	Yes
<input type="checkbox"/> CNRM-ESM2-1 - CNRM-ESM2-1	No
<input type="checkbox"/> MRI-ESM2-0 - MRI-ESM2.0	No
<input type="checkbox"/> GFDL-CM4 - GFDL-CM4	No
<input type="checkbox"/> HadGEM3-GC31-LL - HadGEM3-GC3.1-N96ORCA1	No
<input type="checkbox"/> MPI-ESM1-2-HR - MPI-ESM1.2-HR	No
<input type="checkbox"/> INM-CM4-8 - INM-CM4-8	No
<input type="checkbox"/> INM-CM5-0 - INM-CM5-0	No
<input type="checkbox"/> ACCESS-CM2 - Australian Community Climate and Earth System Simulator Climate Model Version 2	No
<input type="checkbox"/> AWI-CM-1-1-MR - AWI-CM 1.1 MR	No
<input type="checkbox"/> NorESM2-LM - NorESM2-LM (low atmosphere-medium ocean resolution, GHG concentration driven)	No
<input type="checkbox"/> BCC-CSM2-MR - BCC-CSM 2 MR	No
<input type="checkbox"/> CMCC-CM2-SR5 - CMCC-CM2-SR5	No
<input type="checkbox"/> EC-Earth S-p3 - EC-Earth S-p3	No

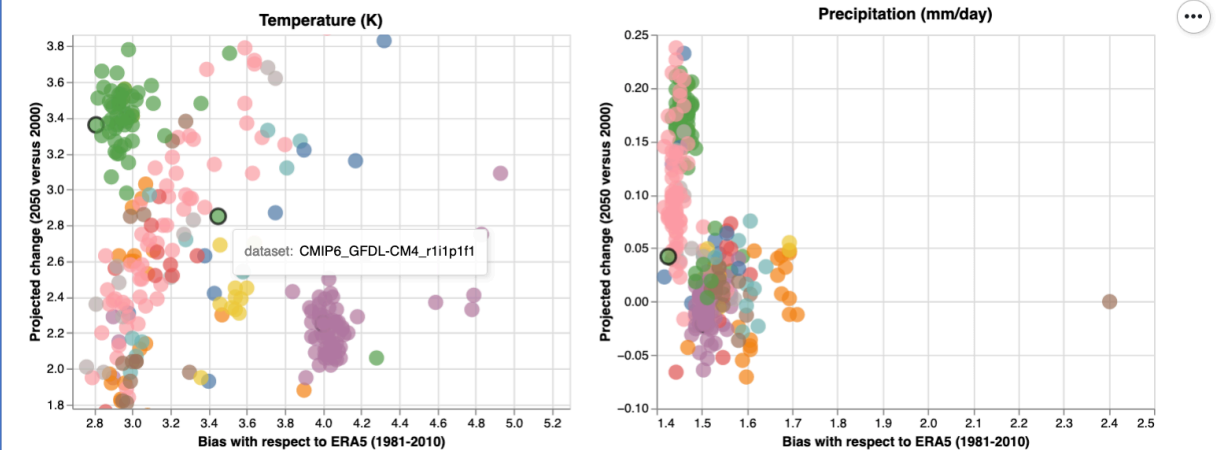
At the bottom of the model list, there is a button labeled 'COMPARE MODEL PERFORMANCE'.

### Climate impact result viewer

This application shows results from CMIP5 and CMIP6 models, calculated with ESMValTool. It is intended to provide some guidance for climate impact researchers, to select one or more datasets that adequately sample the spread of the CMIP ensemble.

- Bias is calculated with respect to the ERA5 reanalysis dataset over the period 1981-2015.
- Future change is calculated for 2036-2065 as compared to 1986-2015.
- Area is set to Europe (lon 0-39; lat 30-76.25)

Hold ctrl to pan and zoom, hold alt to select a range (points will be highlighted in both graphs), then hold shift to select multiple points.

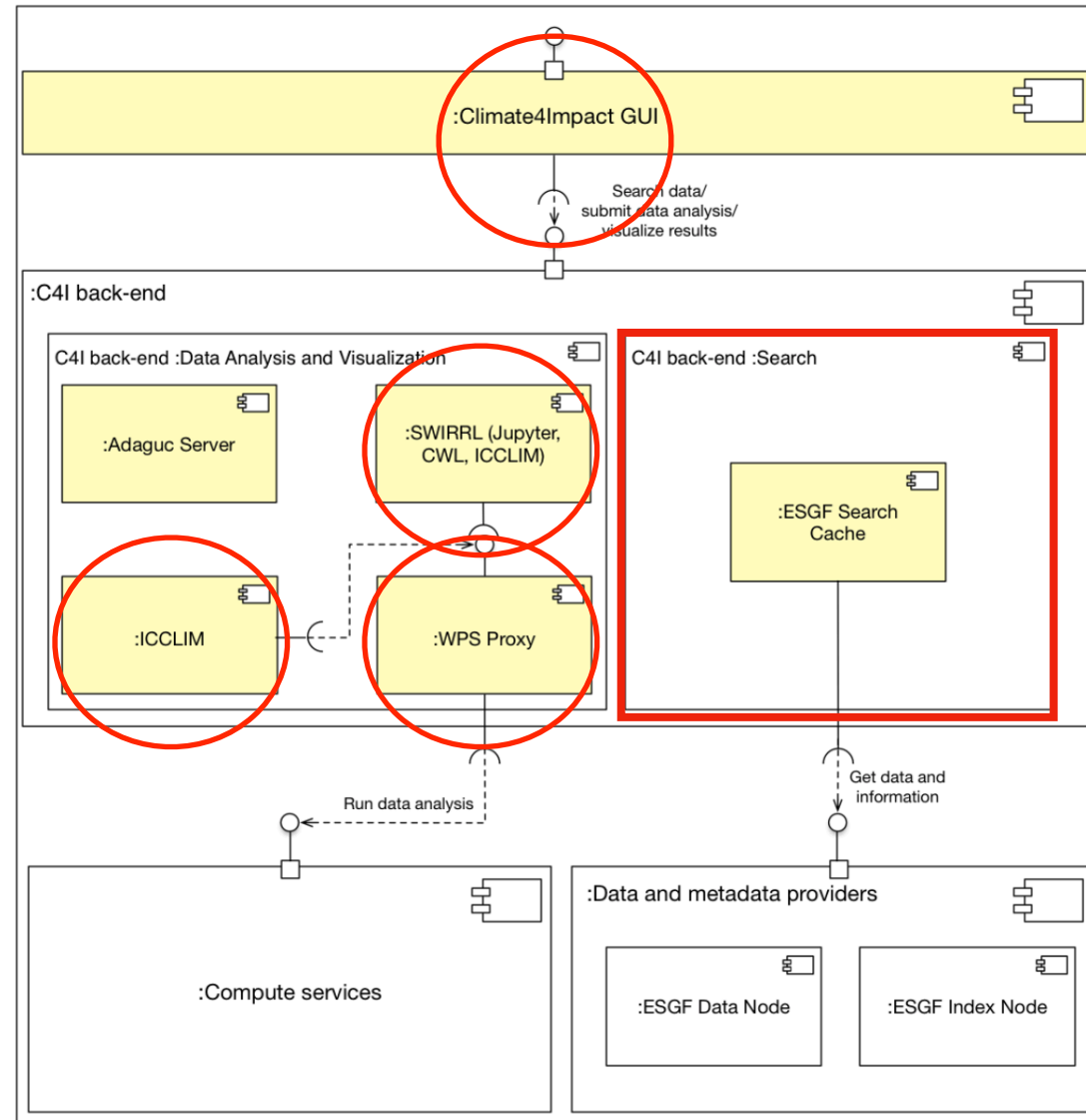


Project\_project CMIP6 ▾

Selected datasets:

- CMIP6\_CanESM5\_r1i1p1f1
- CMIP6\_CNRM-CM6-1\_r1i1p1f1
- CMIP6\_MIROC6\_r1i1p1f1
- CMIP6\_GFDL-CM4\_r1i1p1f1
- CMIP6\_HadGEM3-GC31-LL\_r1i1p1f1

# Climate4Impact (v2) - ENES CDI



→ AAI To CORDEX

→ ESMVal Info

→ Link to DOI Pages ES-DOC

## Alpha Tester Wanted!

- Register at <https://dev.climate4impact.eu>
- **More Notebooks Presets** (CERFACS/Icclim)
- **Enable Collection of Usage stats** (KPIs)
- **Access to CORDEX** (via Future Architecture IdP)

## *CrossWP Activities*

- *Wider support for remote data reduction Workflows (with partners)*
- *PoC of updating to new ESGF Search STAC*

## THE CONSORTIUM

Coordinated by CNRS-IPSL, the IS-ENES3 project  
gathers 22 partners in 11 countries



*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°824084*



Our website  
<https://is.enes.org/>



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**@ISENES\_RI**



Contact us at  
[is-enes@ipsl.fr](mailto:is-enes@ipsl.fr)



Follow our channel  
**IS-ENES3 H2020**