

# Rook

A Web Processing Service for the Copernicus  
Climate Data Store

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# Rook is a Bird



... but that is another story

# Rook

Remote Operations On Klimadaten

(The K is not a typo)





<https://rook-wps.readthedocs.io/en/latest/>

# What?

... wait

# Two days ago

## CMIP6 is now live!



Home Search Datasets Applications Toolbox FAQ Live

### CMIP6 climate projections

Overview

Download data

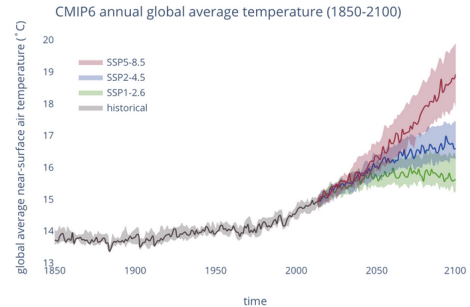
Documentation

This catalogue entry provides daily and monthly global climate projections data from a large number of experiments, models and time periods computed in the framework of the sixth phase of the Coupled Model Intercomparison Project (CMIP6).

CMIP6 data underpins the Intergovernmental Panel on Climate Change 6th Assessment Report. The use of these data is mostly aimed at:

- addressing outstanding scientific questions that arose as part of the IPCC reporting process;
- improving the understanding of the climate system;
- providing estimates of future climate change and related uncertainties;

CMIP6 annual global average temperature (1850-2100)



Year	Historical (°C)	SSP5-8.5 (°C)	SSP2-4.5 (°C)	SSP1-2.6 (°C)
1850	13.8	-	-	-
1900	14.0	-	-	-
1950	14.2	-	-	-
2000	14.5	14.5	14.5	14.5
2050	-	17.5	16.5	15.5
2100	-	19.5	17.5	16.5

# Climate Data Store - Download data

CMIP6 climate projections

Overview

Download data

Documentation

Temporal resolution

☐ Monthly

☒ Daily

☐ Fixed (no temporal resolution)

Experiment ?

☒ Historical

☐ SSP1-1.9

☐ SSP1-2.6

☐ SSP4-3.4



☐ SSP5-3.4OS

☐ SSP4-6.0

☐ SSP3-7.0

☐ SSP5-8.5

# Climate Data Store - Toolbox



Climate Change  
Service

James Varndell [Logout](#)

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cmip6-tests

Console

History

Your queue

Runtime profile

Layout

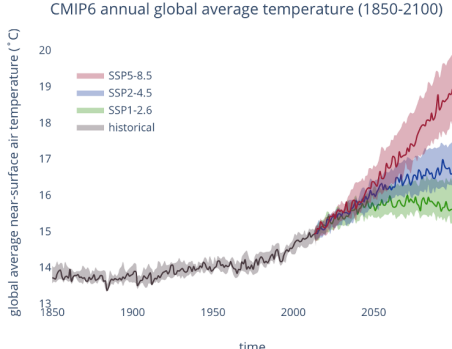
Copy

Save

Run

```
1
2 import itertools
3 import cdstoolbox as ct
4
5
6 MODELS = [
7     'awi_cm1_1_mr',
8     'cams_csml_0',
9     'cmcc_cm2_sr5',
10    'hadgem3_gc31_ll',
11    'iitm_esm',
12    'kace1_0_g',
13    'mpi_esml2_lr',
14    'miroc6',
15    'cnrm_cm6_1_hr',
16 ]
17
18 EXPERIMENTS = [
19     'historical',
20     'ssp1_2_6',
21     'ssp2_4_5',
22     'ssp5_8_5',
23 ]
24
25
26 @ct.application()
27 @ct.output.livefigure()
28 def application():
29     """
30     Simple application to retrieve CMIP6 monthly temperature for three
31     scenarios, calculate the global average and plot the result.
32     """
33     fig = None
34     all_data = {}
35     for experiment, model in itertools.product(EXPERIMENTS, MODELS):
```

CMIP6 annual global average temperature (1850-2100)



Year	Historical (°C)	SSP1-2.6 (°C)	SSP2-4.5 (°C)	SSP5-8.5 (°C)
1850	13.8	-	-	-
1900	13.9	-	-	-
1950	14.0	-	-	-
2000	14.1	14.1	14.1	14.1
2050	-	15.5	16.5	17.5
2100	-	16.5	18.0	19.5

# Climate Data Store - Data?

The climate data is accessed remotely



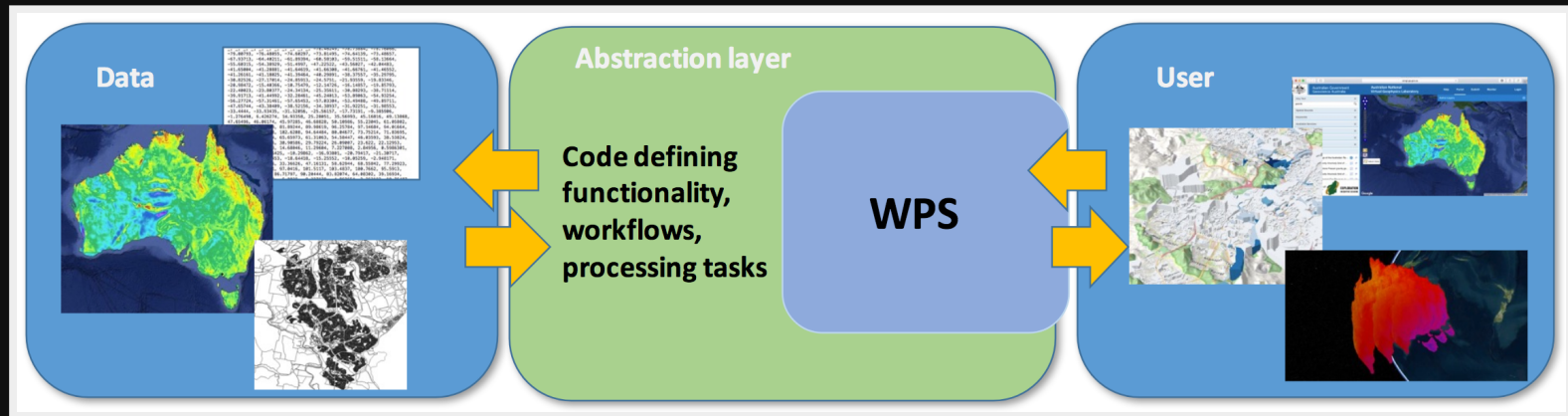
# Remote data access

- Remote data pool for CMIP6, CMIP5, CORDEX
- Load-balanced data servers at three sites (CEDA, IPSL, DKRZ)
- THREDDS Data Server ... but using only file access (not OpenDAP)

# Climate data is big

- A single dataset may have several Gigabytes
- But you just want: Temperature, 1990, Africa

# Web Processing Service



Call a function remotely

# Rook - WPS

- An OGC Web Processing Service
- Using PyWPS - GeoPython
- Providing climate data operators as a service
- Used for data reduction: Temperature, 1990, Africa

# Rook - Operators

- Subsetting - time, area, level
- Averaging - over dimensions (time, ...)
- Regridding (a pain!)
- ??? - can be extended


# Rook - Clisops

- The Python library implementing these operators
- Using xarray - low level library
- Joint effort together with Ouranos  
<https://clisops.readthedocs.io/en/latest/>

# Rooki

- Python WPS client - interactive or as library
- Using OWSLib - GeoPython
- Joint effort with Ouranos (birdy)
- <https://rooki.readthedocs.io/en/latest/>

# Rooki - Notebook

 jupyter  
nbviewer

JUPYTER

FAQ

</>

rooki / notebooks / demo

## Run subset by area operation

Rooki calls climate data operations on the **rook** processing service.

```
In [ ]: import os
os.environ['ROOK_URL'] = 'http://rook.dkrz.de/wps'

from rooki import rooki
```

parameters of subset operation

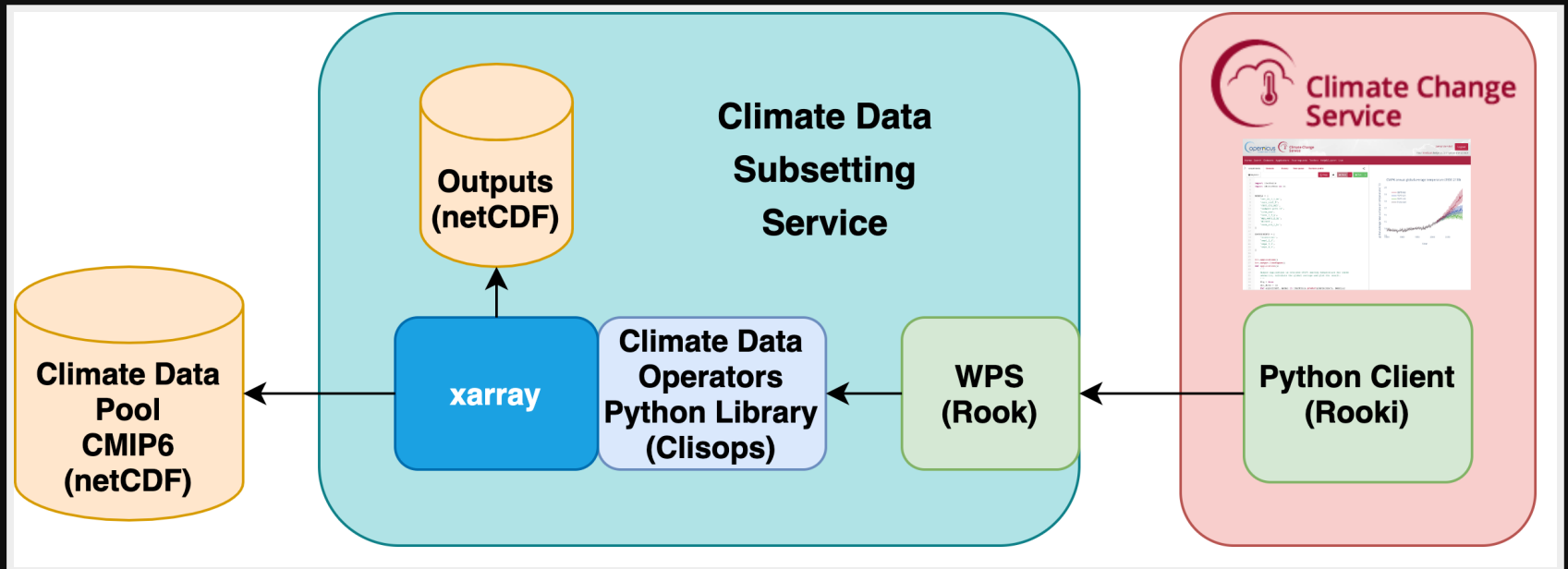
```
In [ ]: rooki.subset?
```

run subset by area

```
In [ ]: resp = rooki.subset(
    collection='c3s-cmip6.CMIP.IPSL.IPSL-CM6A-LR.historical.r1i1p1f1.Amon.rlds.gr.v20180803',
    time='1860-01-01/1980-12-30',
    area='0.,49.,10.,65'
)
resp.ok
```



# All together



# Projects

- Copernicus C3S: <https://climate.copernicus.eu/>
- Roocs: <https://roocs.github.io/>
- Birdhouse: <http://bird-house.github.io/>
- GeoPython: <https://geopython.github.io/>

# Thanks

Questions?