

icclim: A climate indices Open-Source python package C4I Integration

Christian Pagé

CERFACS, Toulouse, France



Royal Netherlands
Meteorological Institute
Ministry of Transport, Public Works
and Water Management





What is the climate4impact portal?

- Platform for researchers to explore climate data and perform analysis
- Connects to ESGF web services
 - ESGF search, THREDDS support, Security
 - CMIP6, CMIP5, CORDEX, other MIPS
- Visualization via ADAGUC
 - Web Map Services for visualization
 - Web Coverage Services for data transformation
- Analysis using PyWPS to perform calculations
 - ICCLIM climate indices calculation, data reduction
 - Personal store for processing outcomes
- Upload and store your own data
 - Visualize your own data online
 - Process your own data online

Welcome to is-enes Climate4Impact

The aim of Climate4Impact is to enhance the use of climate research data. It has been developed within the European projects is-enes, CLIC4IMPACT and CLIC4Impact is connected to the Earth System Grid Federation (ESGF) infrastructure, using certificate based authentication, ESGF search, general download and griddata catalog. The portal aims to support climate change impacts research and adaptation, as well as climate science learning, by providing a user interface to use climate change data. The portal offers web interfaces for searching, visualizing, analyzing, processing and downscaling datasets.

--> Visualize and download data from global climate models (GCM), regional climate models (RCM) and downscaled high resolution climate data using Data discovery. Need some help with this tool?
--> Tools like indices calculations, downscaling, subsampling and regressing are available for tailoring data to your needs goto Process data.
--> Want to know more on how to use climate scenarios, how the climate models model the complex climate system, and see example use cases in several impact and adaptation themes? Go to guidance on using climate data.
--> New here? Create an account and sign in.

Agriculture/Forestry, Energy, Health, Infrastructure/Urban, Marine/Coastal, Nature/Biodiversity, Tourism, Water Management

Basket

File

Remote data

- INTER_OPER_R_P
- tx_icclim_4-23_KM1U
- tx_icclim_4-23_KM1M
- tx_icclim_4-23_KM1H
- CWD_SEP_MPIM_M9
- tx_EUR-05_SMHI-HR
- SNOWD_OFF_2011-07
- tx_icclim_4rcgcs-10-4-0
- tx_icclim_4-23_KM1U
- ctc_dry_ECEARTH_r1
- ano_CGS_pher_r0
- tx_icclim_4-23_GENCS
- tx_icclim_4-23_KM1U
- tx_dry_CSR0-MK3-6-0_r0
- tx_dry_CSR0-MK3-6-0_r0p1
- tx_dry_CSR0-MK3-6-0_r0p1_2010101-22801231.nc
- tx_dry_CSR0-MK3-6-0_r0p1_2010101-22801231.nc
- tx_dry_CSR0-MK3-6-0_r0p1_2010101-22801231.nc

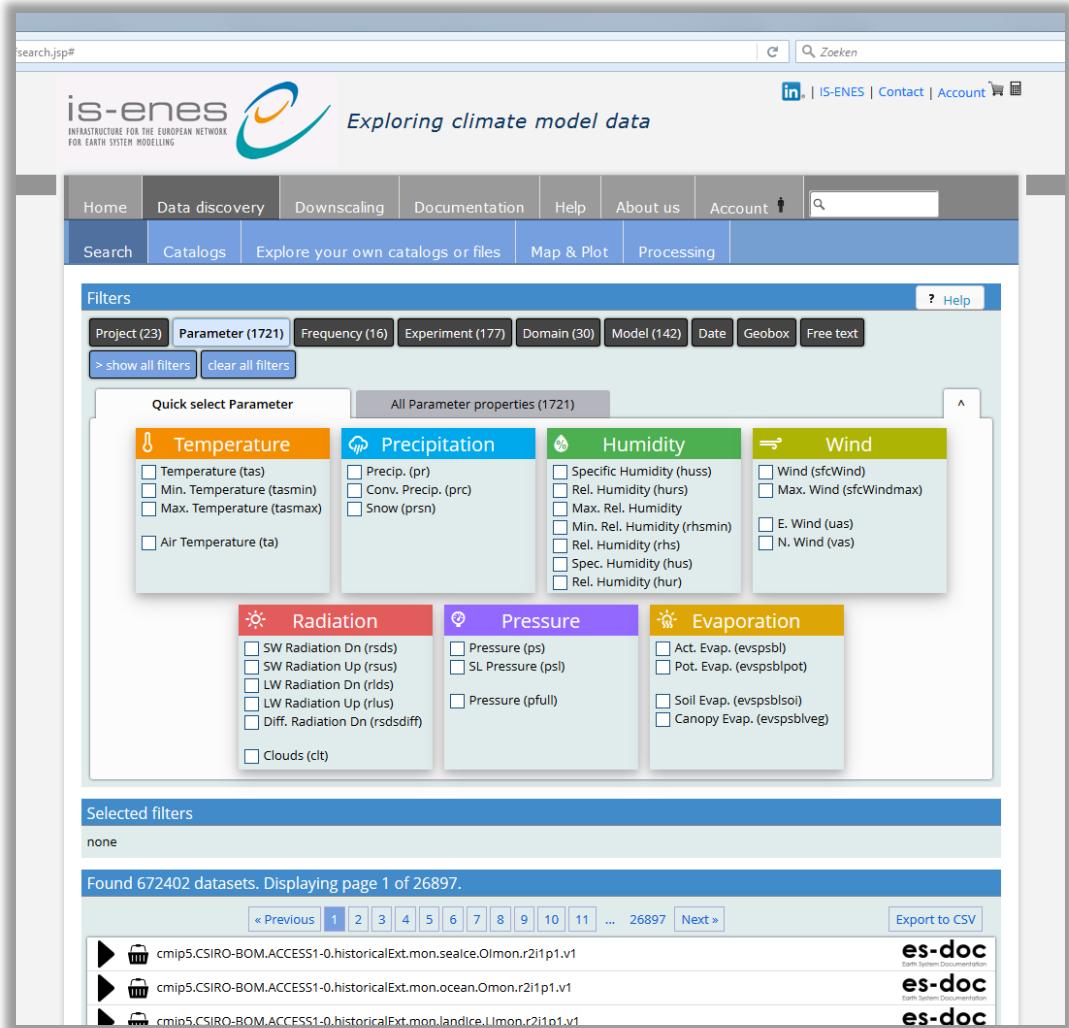
Preview:

Check CLIPC DRS Download Add to basket Reload

My data WPS Settings

Web based faceted search for any (climate) data via ESGF

- Drill down search results
- Tooltips for acronyms
- Quick select menus
- ES-DOC integration
- Preview of data
- Export search list to CSV



The screenshot shows the is-enes search interface at [search.jsp#](#). The top navigation bar includes links for Home, Data discovery, Downscaling, Documentation, Help, About us, Account, and a search bar. Below the navigation is a blue header bar with tabs for Search, Catalogs, Explore your own catalogs or files, Map & Plot, and Processing.

The main content area is titled "Filters" and contains a "Quick select Parameter" section. This section is divided into eight categories: Temperature (orange), Precipitation (blue), Humidity (green), Wind (yellow-green), Radiation (red), Pressure (purple), and Evaporation (orange). Each category lists various climate parameters with checkboxes next to them. For example, under Temperature, there are checkboxes for Temperature (tas), Min. Temperature (tasmin), Max. Temperature (tasmax), and Air Temperature (ta).

Below the filters is a "Selected filters" section which currently says "none". At the bottom, it displays "Found 672402 datasets. Displaying page 1 of 26897." with a page navigation menu from 1 to 26897. There are also "Export to CSV" and "Preview" buttons. The footer features the es-doc logo three times.

Web processing interface for controlling your processes

- Generated user interface
- Lightweight
- Links to preview
- Links to basket / cart
- jQuery based...

title identifier

File A (input1)
application/netcdf
http://opendap.knmi.nl/knmi/thredds/dodsC/CLIPC/storyline_urbanheat/geojson/NUTS_2010_L0.geojson.nc

abstract value
What is the climate4impact portal? - Processing

basket preview delete

Processor CLIPC Create statistics per NUTS region Execute
 Title: CLIPC Create statistics per NUTS region Execute
 Identifier: clipc_extractnuts_execute
 Abstract: The NUTS extractor calculates statistics for any NetCDF file by extracting geographical areas defined in a GeoJSON file. The statistics per geographical area include minimum, maximum, mean and standard deviation. The statistics are presented in a CSV table and a NetCDF file.
 Location: https://climate4impact.eu/impactportal/WPS?service=WPS&version=1.0.0&request=describeprocess&identifier=clipc_extractnuts_execute

Processing inputs

File A (input1) application/netcdf

Processing: [Starting WCS request 2/2: data](50%)

Personal basket

- By default the basket contains:
 - “Remote data” for links
 - “My data” for your own data
- Script based download allows to select and download multiple files
- The basket allows for uploading your own files
 - Can be used in processing or visualization
 - NetCDF, CSV, GeoJSON
- Share your data located in your basket with others

The screenshot shows a web browser window for the Climate4Impact portal. The URL is dev.climate4impact.eu/impactportal/account/basket.jsp. The page title is "Basket". The header includes the is-enes logo and navigation links: Home, Data discovery, Downscaling, Documentation, Help, About us, Account, and a search bar. Below the header, there are tabs: Account (selected), Basket (11), Processing, and Monitor jobs (8). A breadcrumb trail shows Account > Basket.

The main content area is titled "Basket" and displays a table of files. The table has columns for File, DAP, HTTP, Filesize, and Date. The data is organized into two sections: "Remote data" and "My data".

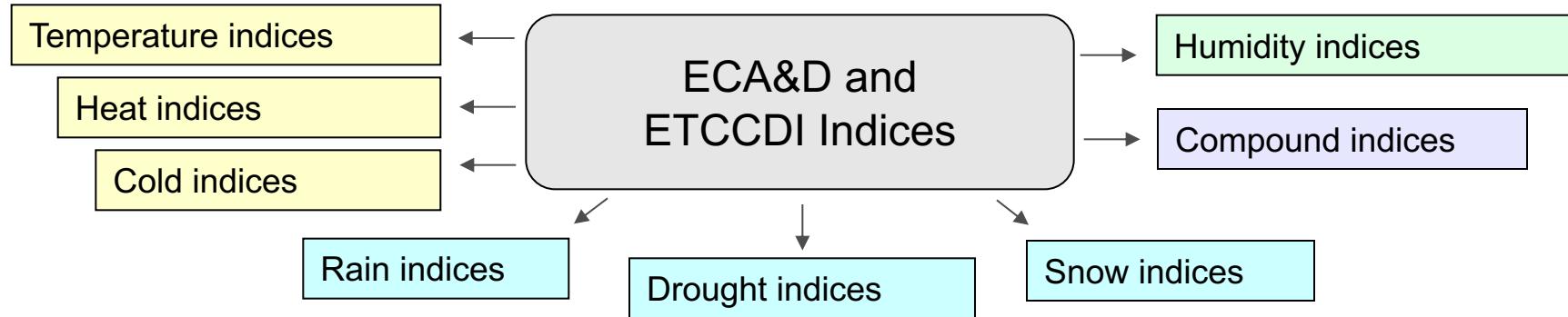
File	DAP	HTTP	Filesize	Date
Remote data				
0.50 deg. regular grid	-	-	-	2015-01-22...
0.44 deg. rotated grid	-	-	-	2015-01-22...
tx_0.44deg_rot_v10.0.nc	true	691.9M	2015-01-22...	
tn_0.44deg_rot_v10.0.nc	true	691.9M	2015-01-22...	
tg_0.44deg_rot_v10.0.nc	true	691.9M	2015-01-22...	
tasmax_day_IPSL-CM5A-LR_historical_r1i1p1_18500101-18991231.nc	true	673.2M	2015-03-19...	
tasmax_day_IPSL-CM5A-LR_historical_r1i1p1_18500101-19491231.nc	true	1.346G	2015-03-19...	
tasmax_day_IPSL-CM5A-LR_historical_r1i1p1_19000101-19491231.nc	true	673.2M	2015-03-19...	
tasmax_day_IPSL-CM5A-LR_historical_r1i1p1_19500101-19991231.nc	true	673.2M	2015-03-19...	
tasmax_day_IPSL-CM5A-LR_historical_r1i1p1_19500101-20051231.nc	true	754.0M	2015-03-19...	
tasmax_AFR-44_CNRM-CERFACS-CNRM-CM5_rcp45_r1i1p1_CLMcom-CCLM4-8-17_v1_day_2096	true	-	-	2015-04-01...
My data				
polar_stereo_m.nc	true	906.824K	2015-01-23...	
tas_WAS-44_ECMWF-ERAINT_evaluation_r1i1p1_ITM-RegCM4-1_v411_mon_198901-199012.nc	true	2.314M	2015-01-23...	
tas_WAS-44_ECMWF-ERAINT_evaluation_r1i1p1_ITM-RegCM4-1_v411_day_19890101-19901231.nc	true	70.463M	2015-01-23...	

At the bottom of the table are buttons for View/Browse file, Download file, Script download, Upload file, Delete file(s), and Reload basket.

At the bottom of the page, there is a message: "You are logged in as https://esg-dn1.nsc.liu.se/esgf-idp/openid/maartenpilleger". Below this, there is a European Union flag and a link to the Disclaimer.

On-demand calculations

Climate indices calculation in climate4impact: **icclim**



- 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 at Cerfacs since September 2013 (EU FP7 IS-ENES2)
 - Generic and modular approach, can be reused in other environments
 - C functions called for optimization
- I/O interface is structured for optimal performance, with wrapper functions and dynamic chunking
- Implement the proper percentile indices calculations when calculation period overlaps reference period (called bootstrapping method)

icclim: climate indices

Documentation: https://icclim.readthedocs.io/en/latest/python_api.html

Source code: <https://github.com/cerfacs-globc/icclim>

Current Version 4.2.14: <https://github.com/cerfacs-globc/icclim/releases/tag/4.2.14>

icclim.indice() - Compute indice

This is the main function to compute an indice:

```
icclim.icclim.indice(in_files, var_name, indice_name=None, slice_mode='year', time_range=None,
out_file='./icclim_out.nc', threshold=None, N_lev=None, lev_dim_pos=1, transfer_limit_Mbytes=None,
callback=None, callback_percentage_start_value=0, callback_percentage_total=100,
base_period_time_range=None, window_width=5, only_leap_years=False, ignore_Feb29th=False,
interpolation='linear', out_unit='days', netcdf_version='NETCDF3_CLASSIC', user_indice=None,
save_percentile=False)
```

Indice	Source variable
TG, GD4, HD17, TG10p, TG90p	daily mean temperature
TN, TNx, TNn, TR, FD, CFD, TN10p, TN90p, CSDI	daily minimum temperature
TX, TXx, TXn, SU, CSU, ID, TX10p, TX90p, WSDI	daily maximum temperature
DTR, ETR, vDTR	daily maximum + daily minimum temperature
PRCPTOT, RR1, SDII, CWD, CDD, R10mm, R20mm, RX1day, RX5day, R75p, R75pTOT, R95p, R95pTOT, R99p, R99pTOT	daily precipitation flux (liquide phase)
SD, SD1, SD5cm, SD50cm	daily snowfall flux (solid phase)
CD, CW, WD, WW	daily mean temperature + daily precipitation flux (liquide phase)





Exploring climate model data

in | IS-ENES | Contact | Account |

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- Account
- Basket (-)
- Processing
- Jobs (-)
- Token API

Account » Processing

Processing wizards

Choose a wizard to help you guide through processing, analysis and data extraction options.

Name	Description
Convert and subset	Extracts a region in space and time, regrids and converts to other formats. Uses the WCS_subsetting WPS in the background.
CLIPC DRS Checker	Checks files against the CLIPC DRS metadata standard.
ICCLIM simple climate indicator calculation	Calculates simple climate indices with ICCLIM.
ICCLIM Time averaging	Computes time averages for any parameter by month, year of various seasons using ICCLIM.
Combine two fields	Performs operation like normalisation and raster arithmetic on two nc files and return the answer as a new file
Polygon overlay	Polygon overlay function to calculate statistics for a gridded file by extracting geographical areas defined in a GeoJSON file. The statistics per geographical area include minimum, maximum, mean and standard deviation. The statistics are presented in a CSV table and a NetCDF file. Statistics can be calculated for several dates at once.

[WPSClient](#)

You are logged in as <https://ceda.ac.uk/openid/Page.Christian>

The [ENES3 project](#) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824084.

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Account » Processing

Web Processing Services

Web processing services are processing services are used by the wizard but can be controlled manually.

Select a WPS Service:

Name	Abstract
Polygon overlay	Polygon overlay function to calculate statistics for a gridded file by extracting geographical areas defined in a GeoJSON file. The statistics per geographical area include minimum, maximum, mean and standard deviation. The statistics are presented in a CSV table and a NetCDF file. Statistics can be calculated for several dates at once.
CLIPC Create statistics per NUTS region Identify	Identify process for statistics per NUTS region calculations
CLIPC Create statistics per NUTS region Execute	The NUTS extractor calculates statistics for any NetCDF file by extracting geographical areas defined in a GeoJSON file. The statistics per geographical area include minimum, maximum, mean and standard deviation. The statistics are presented in a CSV table and a NetCDF file.
CLIPC Combine Identify	Lists possible operations for two resources for the CLIPC Combine processor.
CLIPC Combine Execute	Performs operation on two nc files and returns the answer as nc file
CLIPC ICCLIM simple indicator calculator Identify	Identify function for ICCLIM simple indicator calculator
CLIPC ICCLIM simple indicator calculator Execute	Using ICCLIM, single input indices of temperature TG, TX, TN, TXx, TXn, TNx, TNn, SU, TR, CSU, GD4, FD, CFD, ID, HD17; of rainfall: CDD, CWD, RR, RR1, SDII, R10mm, R20mm, RX1day, RX5day; and of snowfall: SD, SD1, SD5, SD50 can be computed.
CLIPC DRS Checker	Checks file for correct DRS
SimpleIndices	Computes single input indices of temperature TG, TX, TN, TXx, TXn, TNx, TNn, SU, TR, CSU, GD4, FD, CFD, ID, HD17; of rainfall: CDD, CWD, RR, RR1, SDII, R10mm, R20mm, RX1day, RX5day; and of snowfall: SD, SD1, SD5, SD50 can be computed.

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Account » Processing

Web Processing Services

Web processing services are processing services used by the wizard but can be controlled manually.

Select a WPS Service: Default climate4impact processing services

Name	Abstract
SimpleIndices Cached	Computes single input indices of temperature TG, TX, TN, TXx, TXn, TNx, TNn, SU, TR, CSU, GD4, FD, CFD, ID, HD17; of rainfall: CDD, CWD, RR, RR1, SDII, R10mm, R20mm, RX1day, RX5day; and of snowfall: SD, SD1, SD5, SD50.
RangelIndices	Computes temperature range indices: ETR, DTR, DTRv.
PercentileIndices	Computes single input, percentile based indices of temperature: TG10p, TX10p, TN10p, TG90p, TX90p, TN90p, WSDI, CSDI; and of rainfall R75p, R95p, R99p, R75TOT, R95TOT, R99TOT.
RainTemperatureIndices	Computes dual input indices of rain and temperature: CD, CW, WD, WW.
SpatialSelection	Spatial extraction/subsetting.
TimeAveraging	Computes time averages for any parameter by month, year of various seasons.
AnomalyCalculation	Calculates an anomaly of a variable: average of a long period compared to a base reference period (e.g. 2071-2100 compared to 1971-2000 for example).
Perform operation on two numbers	Performs operation on two numbers and returns the answer
Perform operation on two numbers 10 seconds	Performs operation on two numbers and returns the answer, updates every second its status for 10 seconds.
CLIPC Advanced Combine	KNMI WPS Process: CLIPC Advanced combine two inputs into a single netCDF. The combine function provides a visual exploration tool for dataset joins. Any two datasets can be joined via user to a single.

[use](#)

You are logged in as <https://ceda.ac.uk/openid/Page.Christian>



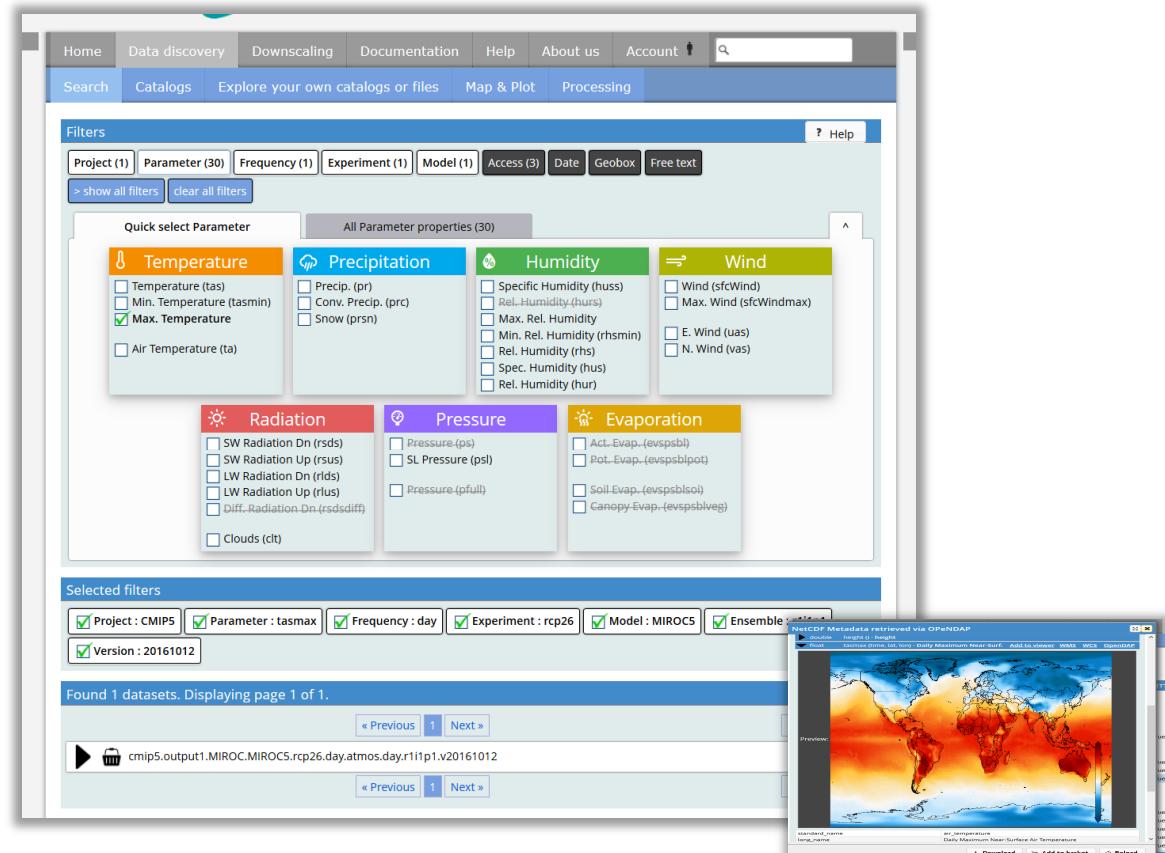
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[Disclaimer](#)



Example use case with Climate4Impact - Search

- Calculate number of days where maximum temperature is above 25 degrees per European country, based on experiment RCP 2.6 and model MIROC5
- Go to C4I and sign in
- Go to Search and select:
 1. Model: CMIP5
 2. Parameter: tasmax
 3. Time frequency: daily
 4. Experiment: rcp26
 5. Model: MIROC5,
 6. Ensemble: r1i1p1
 7. Select the latest version
- Select a file from the dataset and add it to your basket



Example use case with Climate4Impact - Calculate SU

- Go to Processing and select ICCLIM simple indicator calculations
- Select SU, Summer days. Leave the threshold to 25 degrees Celsius
- Select the file from your basket and click “Start processing”
- Inspect the output

Overview

Processor CLIPC ICCLIM simple indicator calculator Execute

Title: CLIPC ICCLIM simple indicator calculator Execute

Identifier: clipc_simpleindicator_execute

Abstract: Using ICCLIM, single input indices of temperature (TG, TX, TN, Txk, Txn, Thx, Thn, SU, TR, CSU, GD4, FD, CPD, ID, HD17); of rainfall: CDD, CWD, RR, RR1, SDII, R10min, R20min, RX1day, RX5day; and of snowfall: SD, SD1, SD5, SD50 can be computed.

Location: https://climate4impact.eu/impactportal/WPS?service=WPS&version=1.0.0&request=describeprocess&identifier=clipc_simpleindicator_execute

Start processing

Processing succeeded! Showing report:

Identifier	Title	Type	MimeType	Value
openDataURL	openDataURL	integer		<a href="https://climate4impact.eu/impactportal/D4/ceda.ac.uk/openid Maarten.Bleg
er/WPS_Scratch/WPS_clipc_simpleindicator_execute_20190404T123422Z/out
.iclim.nc">https://climate4impact.eu/impactportal/D4/ceda.ac.uk/openid Maarten.Bleg er/WPS_Scratch/WPS_clipc_simpleindicator_execute_20190404T123422Z/out .iclim.nc

Processing inputs

Indicator name (indicateName): The indicator to calculate
SU - Number of Summer Days (tmax >

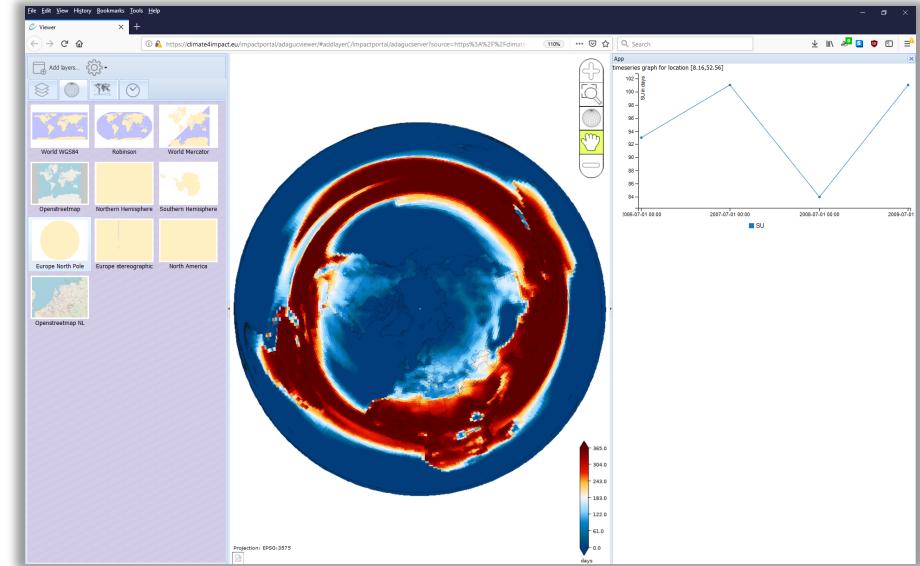
Time slice mode (sliceMode): Selects temporal grouping to apply for calculation
year - Yearly time period

Indicator threshold (threshold): The number of days to consider as summer days

NetCDF Metadata retrieved via OPENDAP

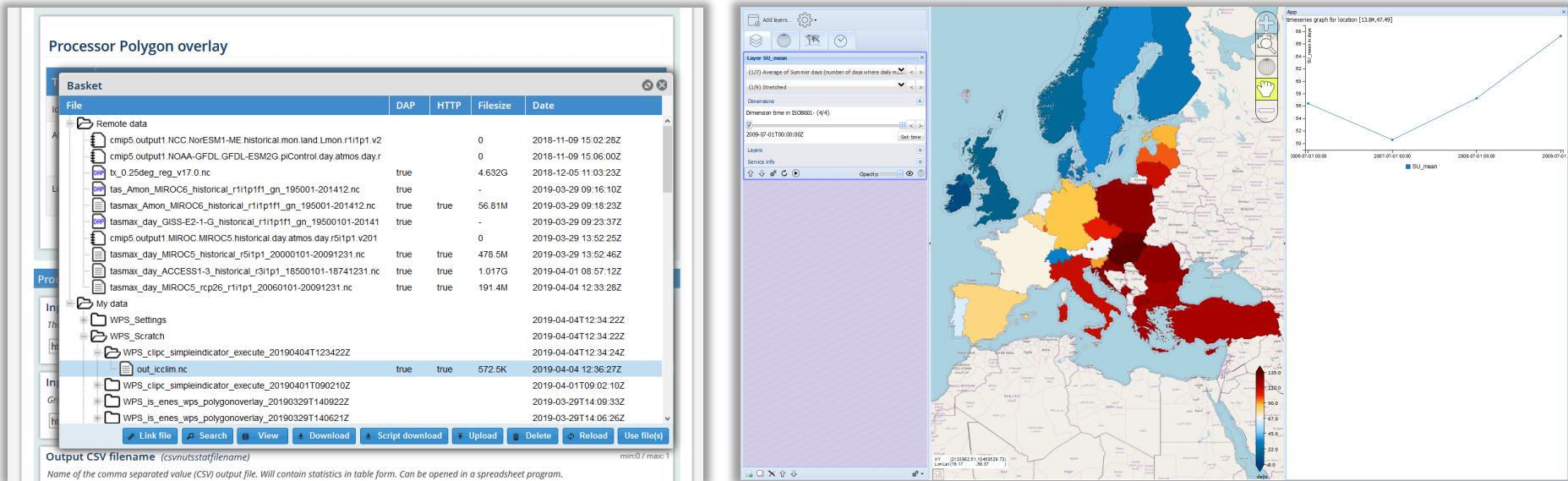
Preview:

Download **Add to basket** **Reload**



Example use case with Climate4Impact - Region statistics

- Go to Processing and select Polygon overlay
- For “Input File B - Gridded data”, choose the latest result with SU from your basket. This is the most recent folder under WPS_Scratch
- As variable select “SU”, as time range select “*”
- Click “Start processing”



Thanks !

On behalf of the climate4impact team

- For questions, suggestions, feedback and help, please contact
 - Christian Pagé christian.page@cerfacs.fr

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→ Visualize and download data from global climate models (GCM), regional climate models (RCM) and downscaled high resolution climate data using Data discovery. Need some help with this tool?

→ Tools like indices calculations, downscaling, subsetting and regridding are available for tailoring data to your needs: goto Process data.

→ Want to know more on how to use climate scenarios, how the climate models model the complex climate system, and see example use cases in several impact and adaptation themes? Go to guidance on using climate data.

→ New here? Create an account and sign in.

Click on one of these images to go to a specific climate change impact and adaptation theme.

You are logged in as https://ceda.ac.uk/openid/Maarten.Plieger

Disclaimer

Basket (609)

NetCDF Metadata

https://climate4impact.eu/impactportal/DAP/ceda.ac.uk.openid.Maarten.Plieger/ewstace.mockup.R00262.tes.20100604.nc

File

- Remote data
 - INTER_OPER_R_Precip
 - tasmax_day_EC-EARTH
 - tas_EUR-11_CNRM-CM5
 - vTR_SEP_MPI-M-MR
 - DGEV_CONUS_12km
 - swe_fmi-assimilation-a
 - tas_Amon_NorESM1A
 - fld_R-raster-2.5_2_P0
 - tas_day_EC-EARTH
 - tx_iclcam-4.2.3_KNMI
 - tx_iclcam-4.2.3_KNMI
 - CWD_SEP_MPI-M-MR
 - tx_EUR-05_SMHI-HIR
 - SNOW_OFF_2011-07
 - wetland_arctis-10-0
 - tx_iclcam-4.2.3_KNMI
 - cld_day_EC-EARTH
 - ano_CGS_pheno_JRC
 - tx_iclcam-4.2.3_KNMI
 - su_cbd-1.6-1_GERCS
 - pr_day_CSIRO-Mk3-6-0_rcp85_z21p1_22810101-23001231.nc
 - pr_day_CSIRO-Mk3-6-0_rcp85_z21p1_22610101-23001231.nc
 - pr_day_CSIRO-Mk3-6-0_rcp85_z21p1_22410101-22601231.nc

Preview:

Check CLIPC DRS Download Add to basket Reload

My data

WPS_Settings

2016-12-03T19:25:45Z

