icclim: A climate indices Open-Source python package

C4I Integration

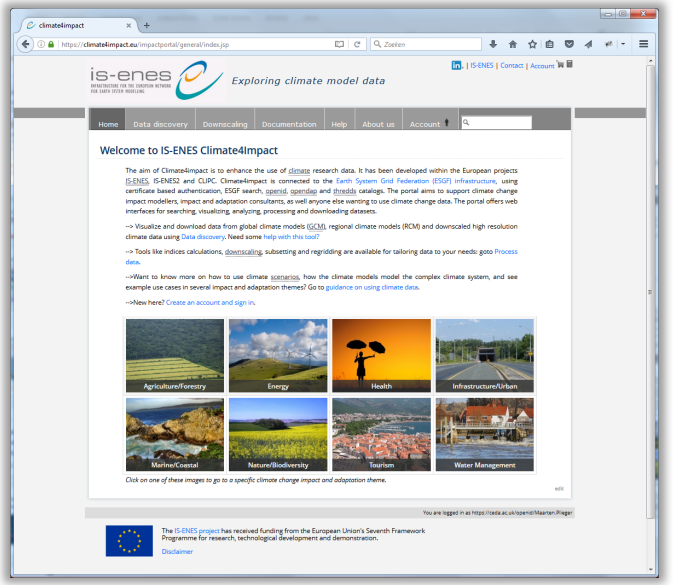
Christian Pagé

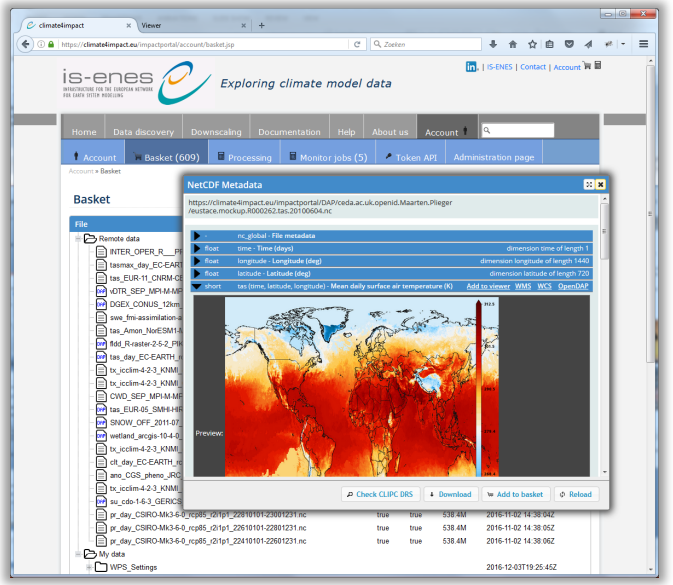
CERFACS, Toulouse, France

CC BY

What is the climate4impact portal?

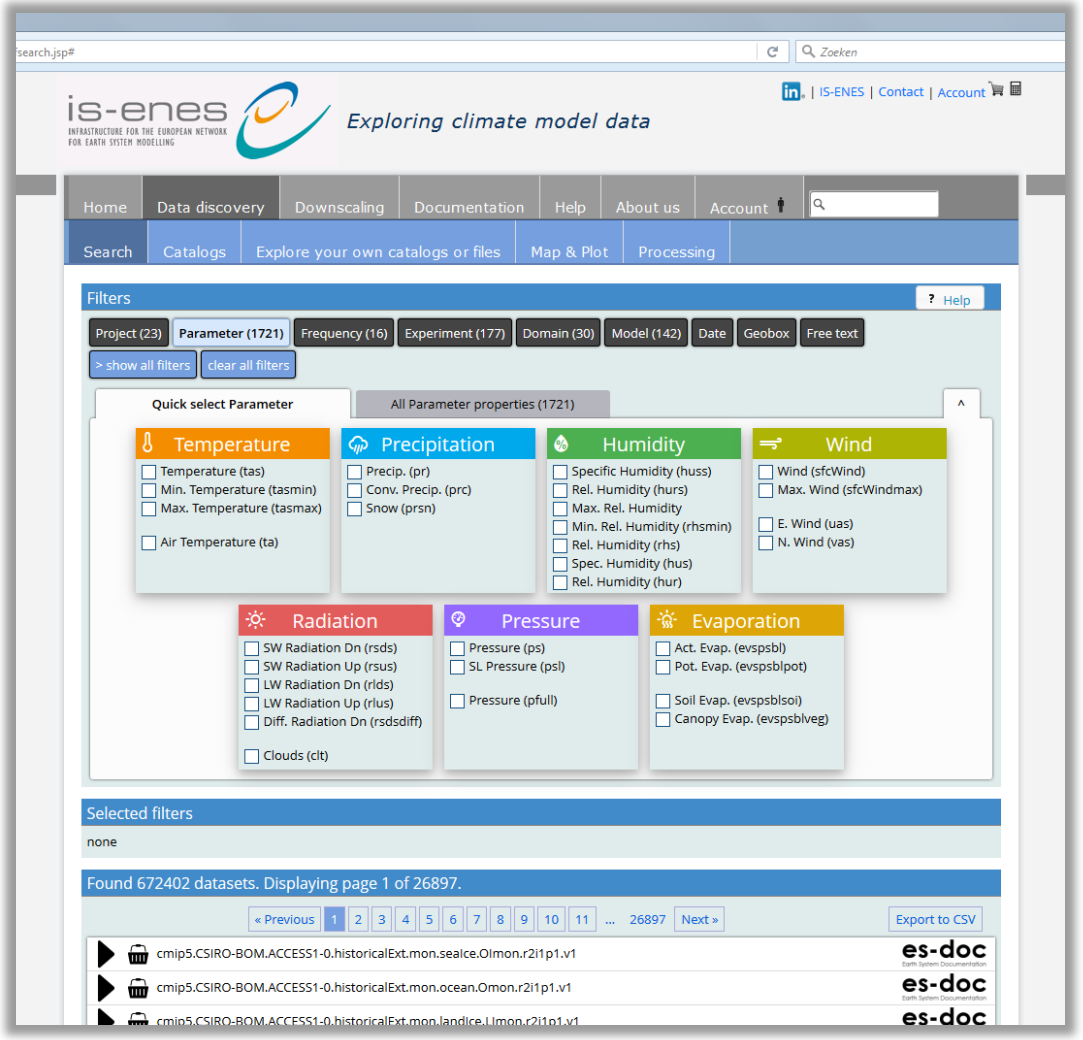
- Platform for researchers to explore climate data and perform analysis
- Connects to ESGF web services
  - ESGF search, THREDDS support, Security
  - CMIP6, CMIP5, CORDEX, other MIPS
- Visualization via ADAGUC
  - Web Map Services for visualization
  - Web Coverage Services for data transformation
- 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





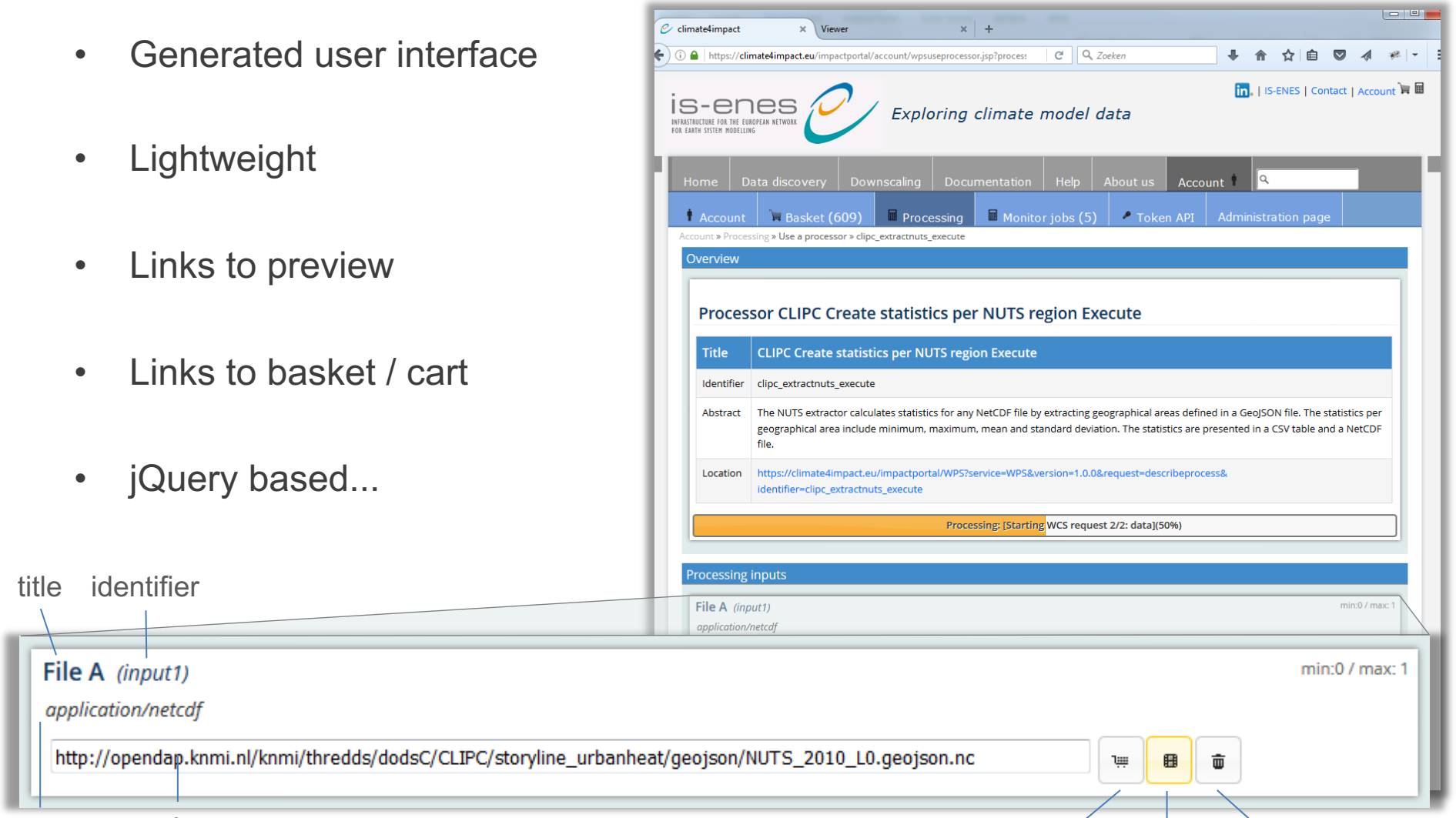
Web based faceted search for any (climate) data via ESGF

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



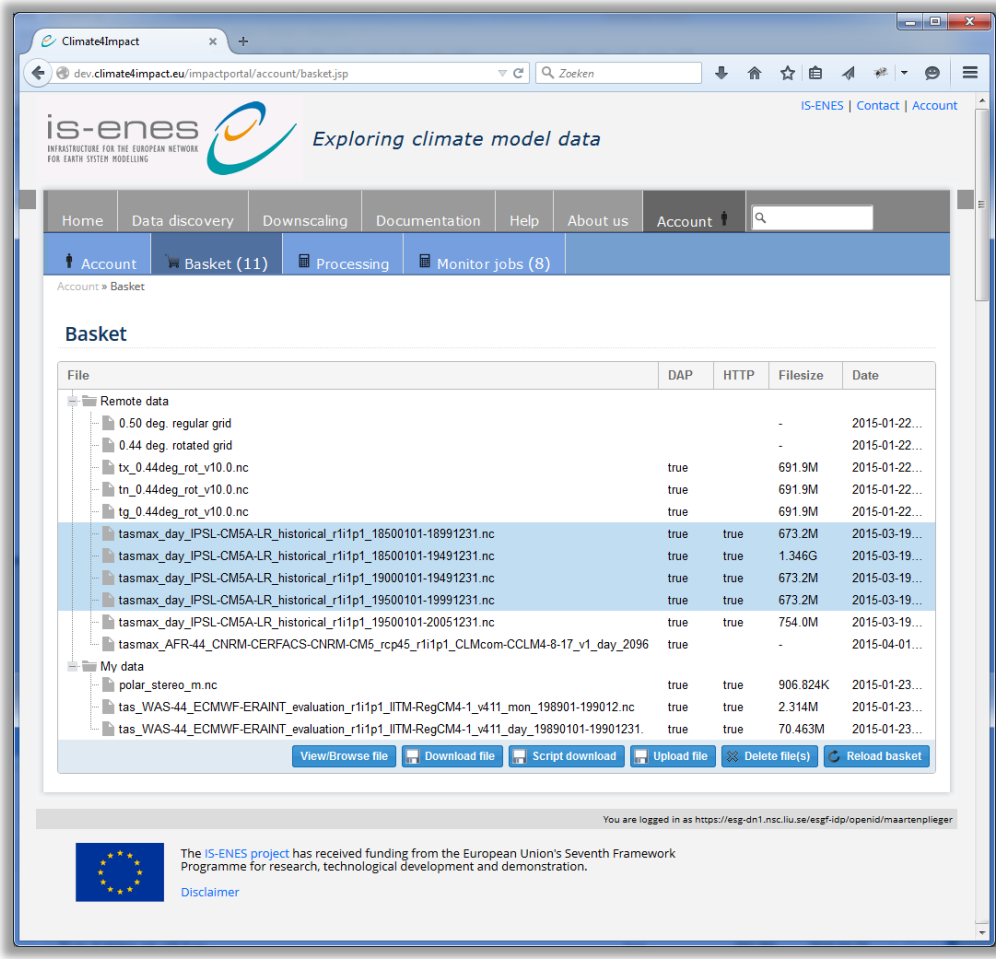
Web processing interface for controlling your processes

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



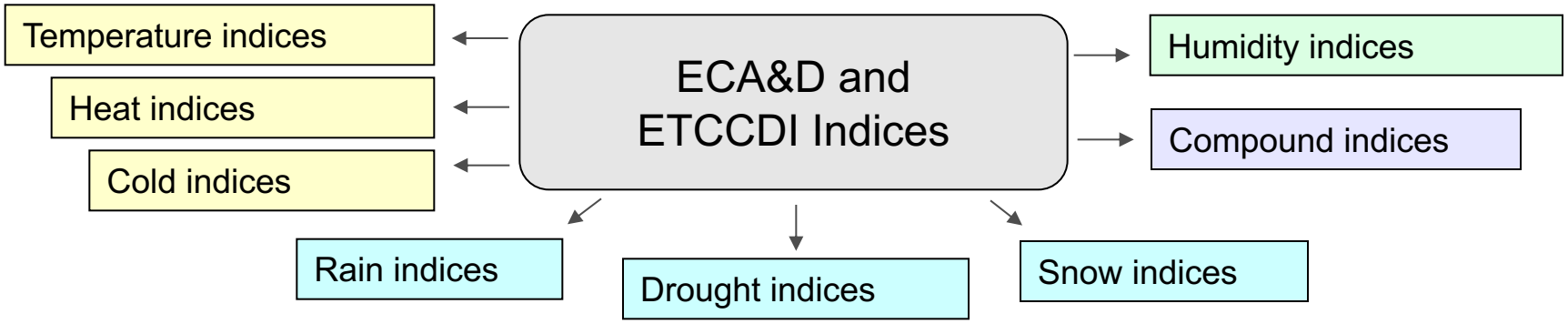
Personal basket

- 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



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

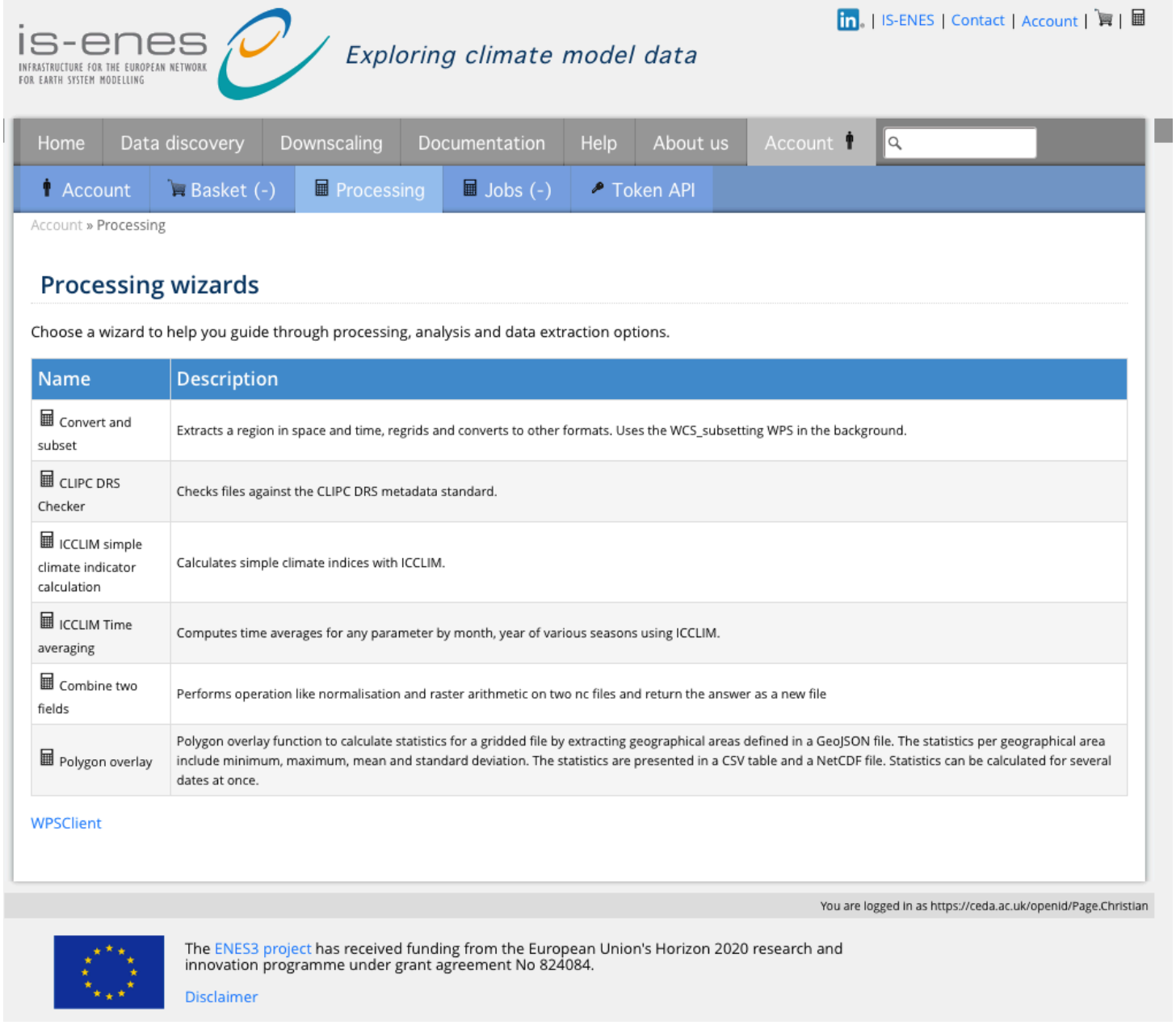
`icclim.indice()` - Compute indice

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)

icclim: climate indices



is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

Exploring climate model data

IS-ENES | Contact | Account

Home | Data discovery | Downscaling | Documentation | Help | About us | Account

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.

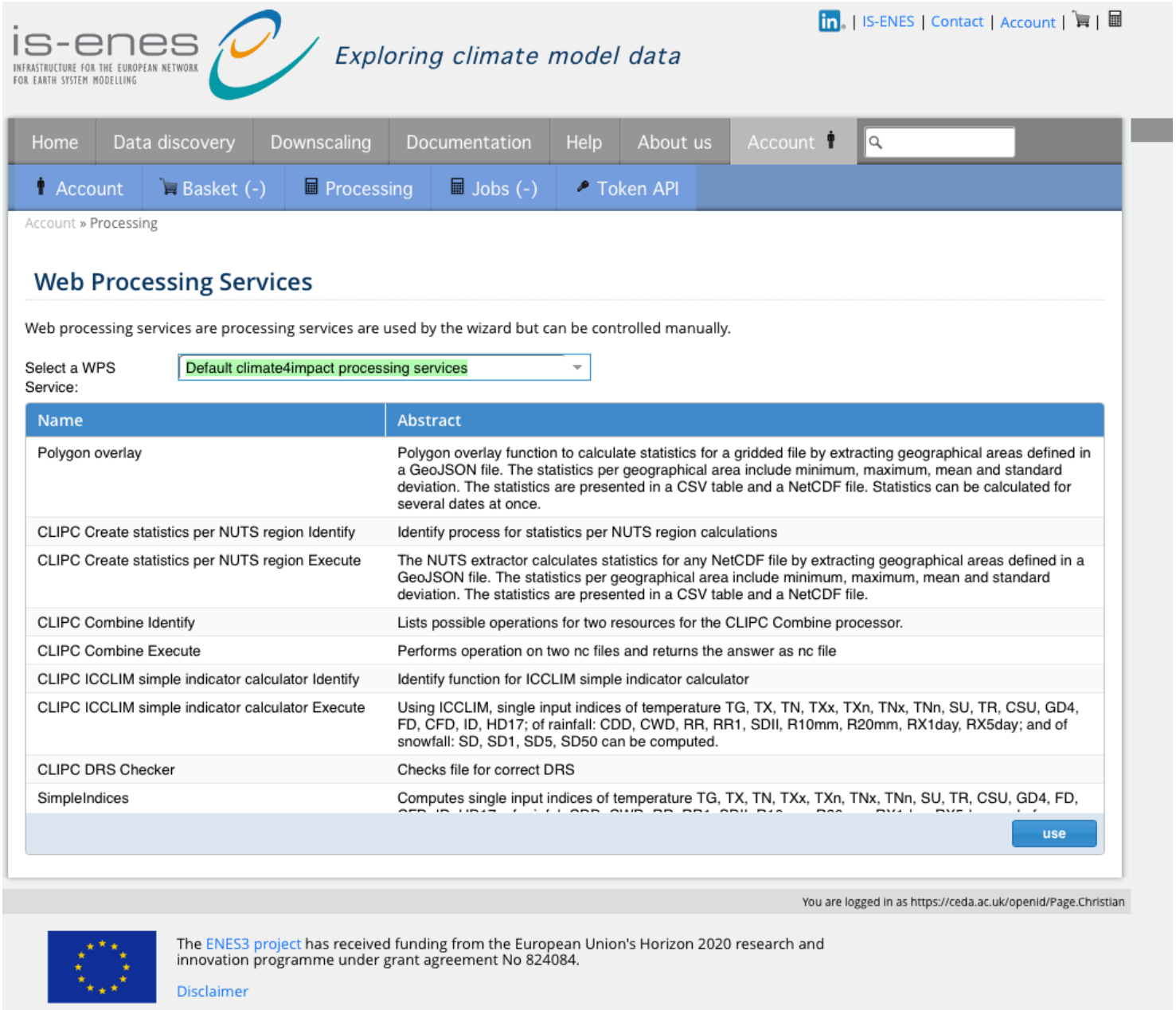
WPSClient

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

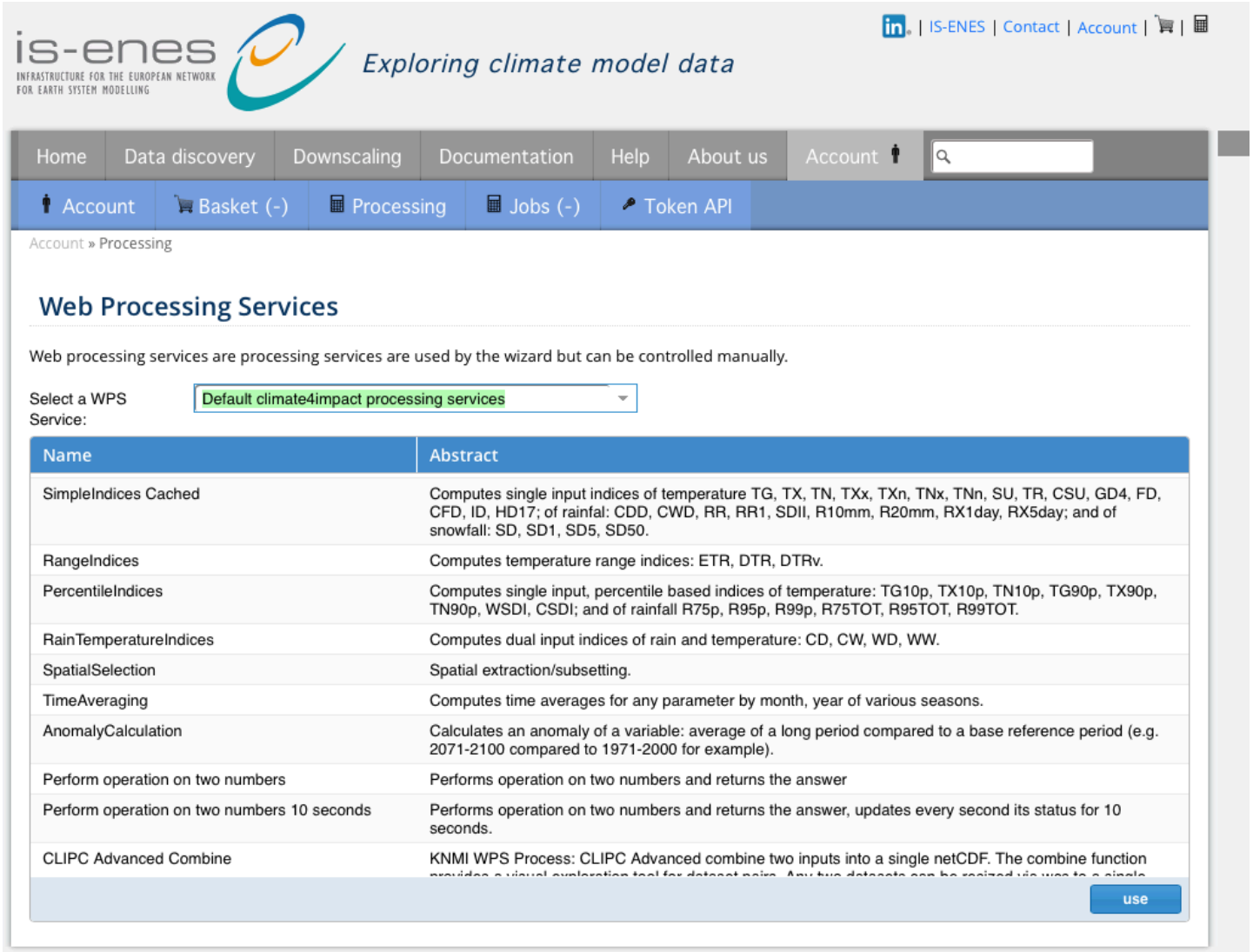
The ENES3 project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824084.

Disclaimer

icclim: climate indices



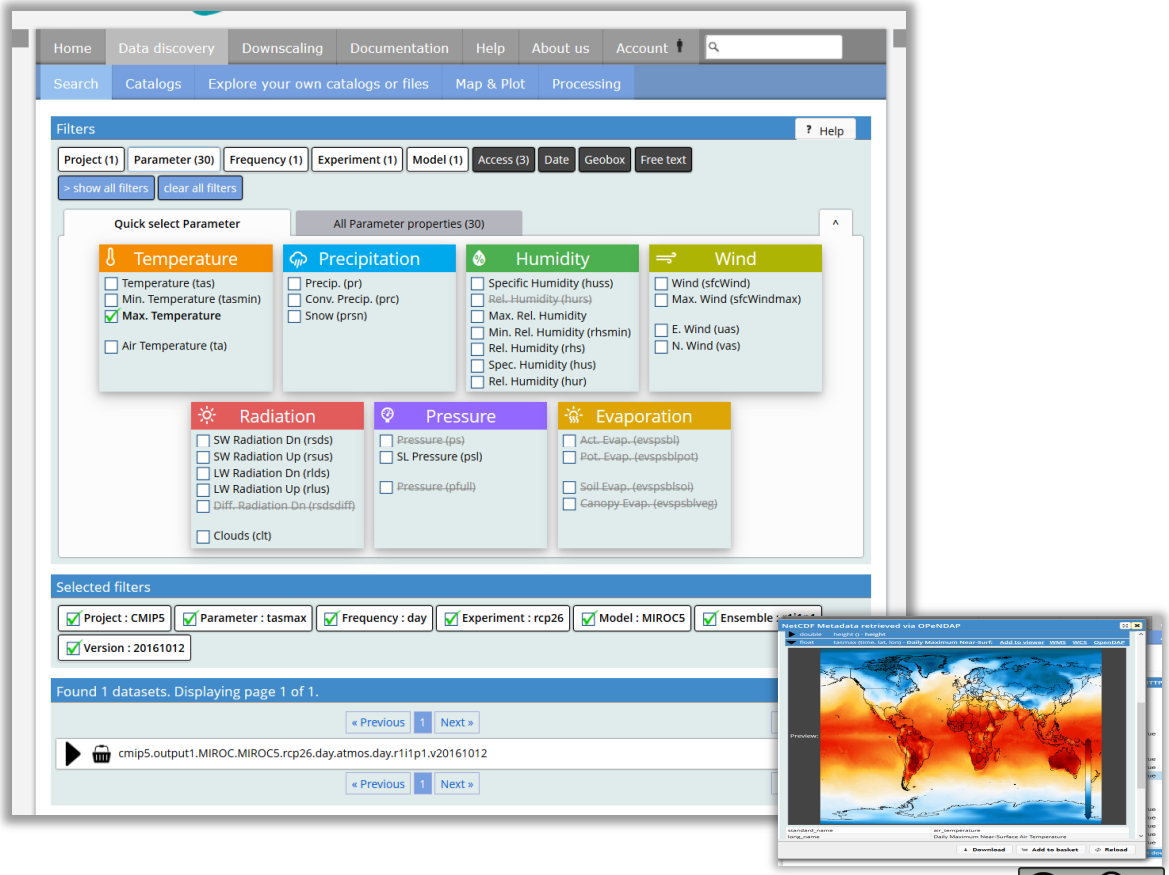
icclim: climate indices



Example use case with Climate4Impact - Search

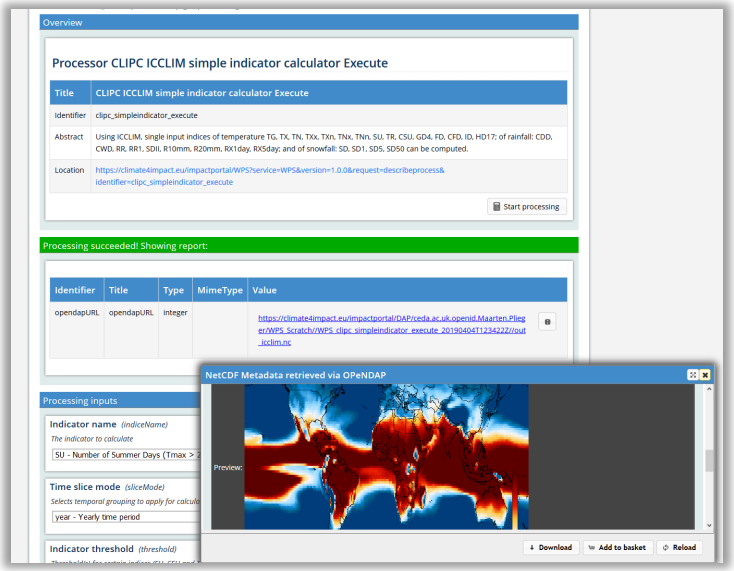
- Calculate number of days where maximum temperature is above 25 degrees per European country, based on experiment RCP 2.6 and model MIROC5

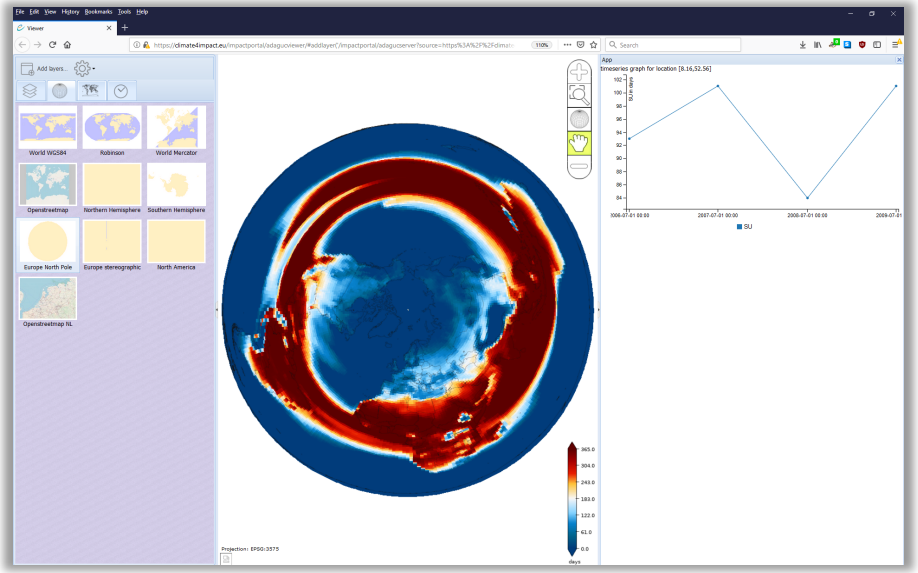
- Go to C4I and sign in
- Go to Search and select:
  1. Model: CMIP5
  2. Parameter: tasmax
  3. Time frequency: daily
  4. Experiment: rcp26
  5. Model: MIROC5,
  6. Ensemble: r1i1p1
  7. Select the latest version
- Select a file from the dataset and add it to your basket



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

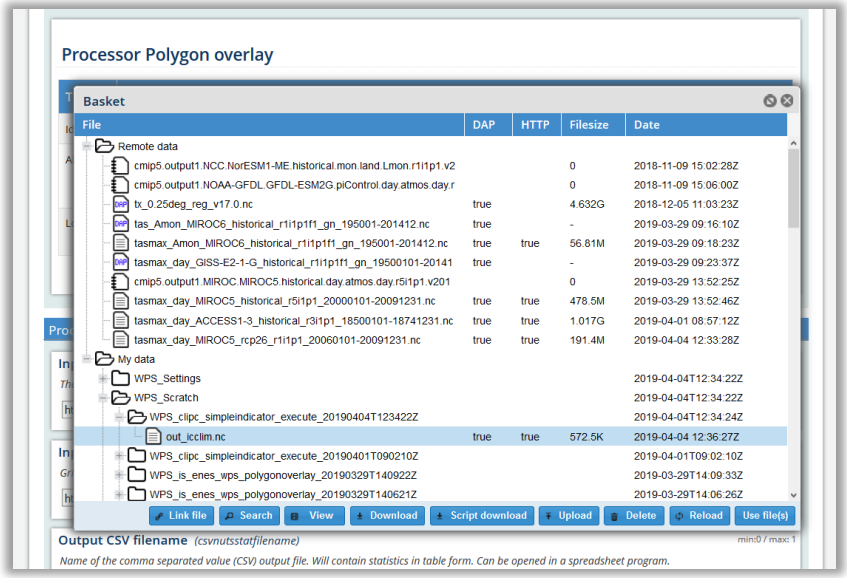


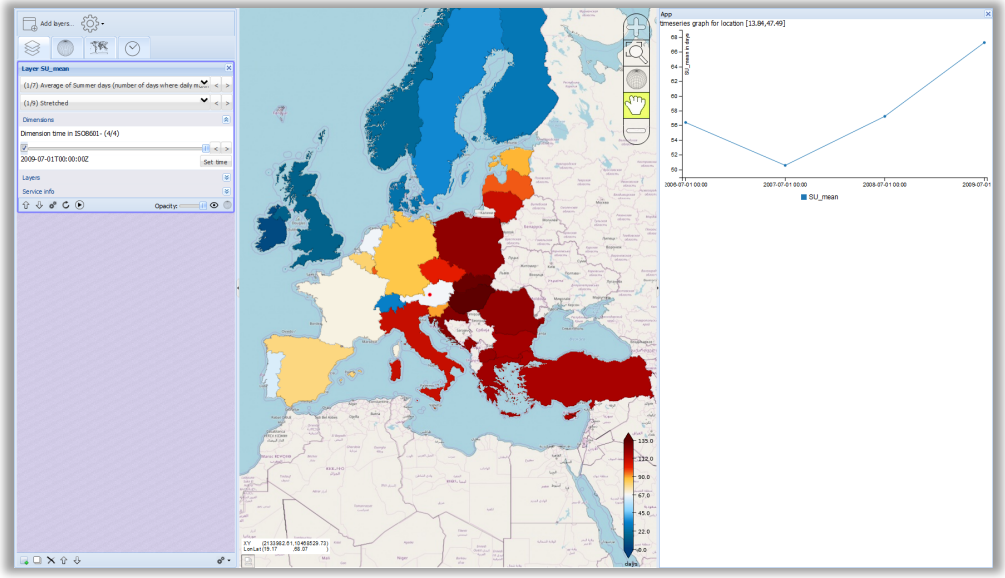


CC BY

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”

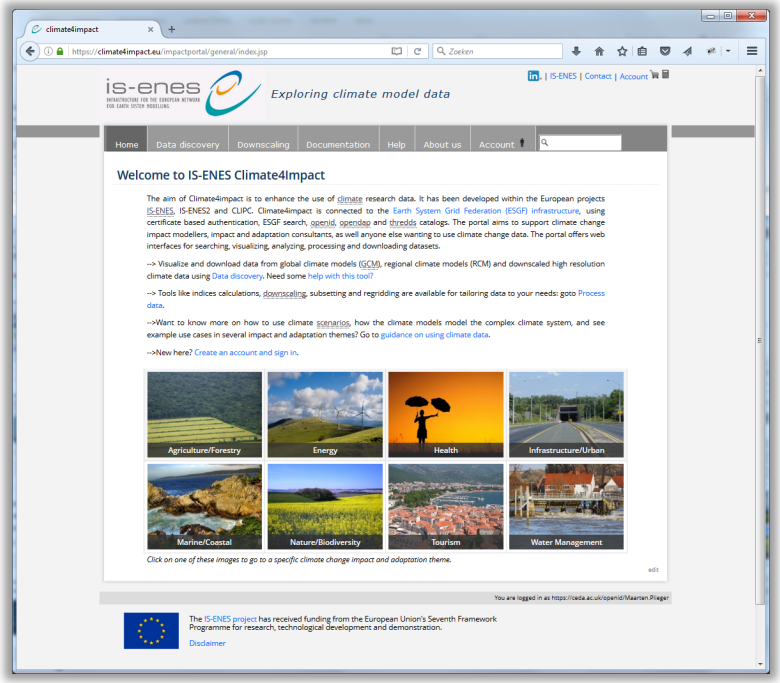


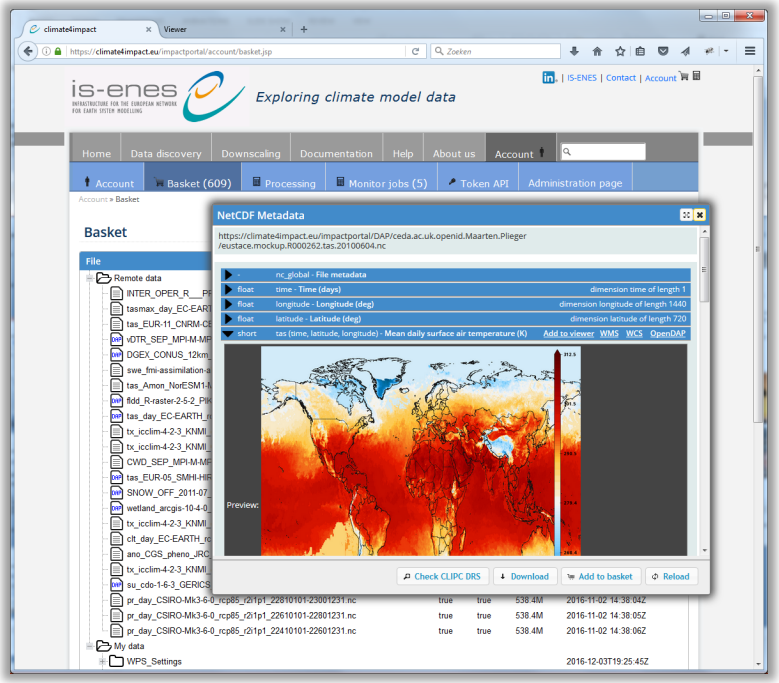


Thanks !

On behalf of the climate4impact team

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





is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

CC BY