

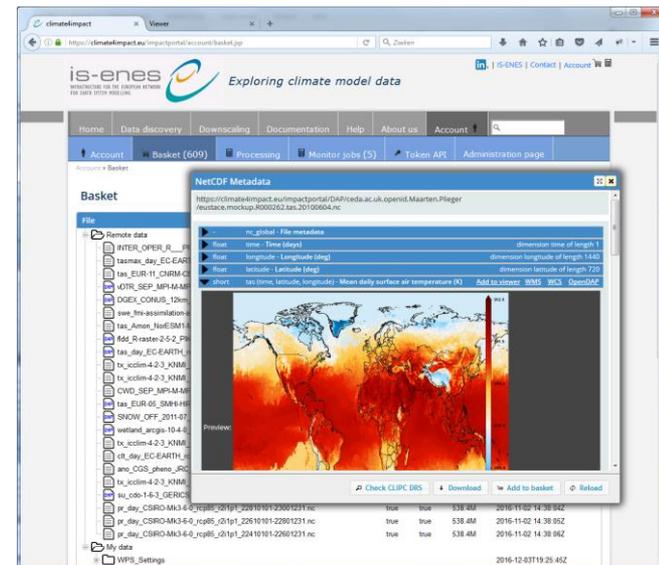
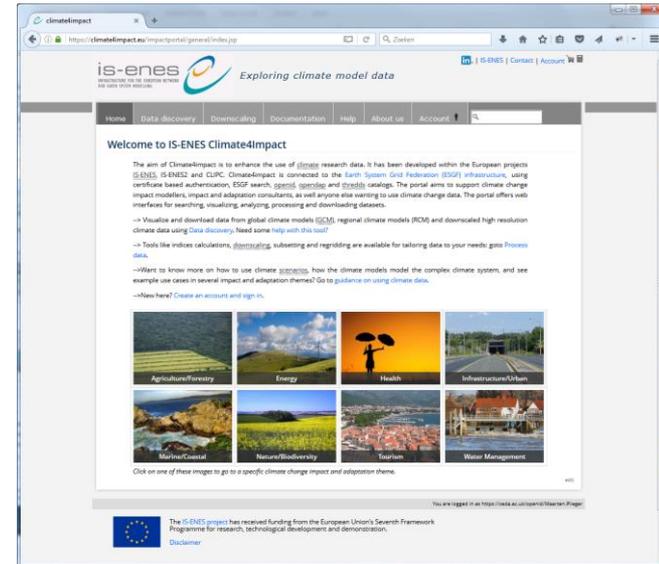
Application of web processing services in the climate4impact.eu portal

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What is climate4impact?

- Platform for researchers to explore climate data and perform analysis
- Connects to ESGF web services
 - Searches ESGF using search API
 - Security arranged via certificates and OpenID
 - Uses THREDDS Catalogs and OpenDAP
- Uses ADAGUC WMS/WCS
 - Web Map Services for visualization
 - Web Coverage Services for data transformation
- PyWPS to perform calculations / process data
 - ICCLIM climate indices calculation, data reduction
- Personal store for processing outcomes
- Backend for other portals (CLIPC)



Faceted search in ESGF for climate impact researchers

- Many iterations with users
- Tooltips with explanations
- Quick select menus
- ES-DOC integration
- Preview of data
- Export to CSV
- Reusable & modular

The screenshot displays the ESGF search interface. At the top, there is a search bar and navigation links for Home, Data discovery, Downscaling, Documentation, Help, About us, and Account. Below the navigation is a search bar and a 'Go' button. The main content area features a 'Filters' section with a 'Help' icon. The filters are categorized by Project (23), Parameter (1721), Frequency (16), Experiment (177), Domain (30), Model (142), Date, Geobox, and Free text. A 'Quick select Parameter' section is visible, showing a grid of parameter categories: Temperature, Precipitation, Humidity, Wind, Radiation, Pressure, and Evaporation. Each category has a list of checkboxes for specific parameters. Below the filters, there is a 'Selected filters' section showing 'none'. A message indicates 'Found 672402 datasets. Displaying page 1 of 26897.' A pagination bar shows page 1 of 26897, with 'Previous' and 'Next' buttons. An 'Export to CSV' button is also present. The bottom of the page shows a list of datasets, each with a play button icon and a file name, and an 'es-doc' logo.

View metadata and graphical view of data

- Data found after ESGF search
- Data “placed” in basket
- When exploring THREDDS catalogs
- View in external viewer with other layers
- NetCDF file metadata
- Data download

The screenshot displays a web application interface for viewing NetCDF metadata. At the top, there is a navigation menu with links for Home, Data discovery, Downscaling, Documentation, Help, About us, and Account. A search bar is located on the right side of the menu. Below the menu, the main content area is titled "NetCDF Metadata" and contains a section for "File metadata and variables". This section lists several variables with their data types and dimensions:

Variable Name	Data Type	Dimensions
nc_global - File metadata	-	-
lon - longitude	double	dimension lon of length 320
lat - latitude	double	dimension lat of length 160
time - time	double	dimension time of length 12
lon_bnds (lon, nv) - lon_bnds	double	-
lat_bnds (lat, nv) - lat_bnds	double	-
time_bnds (time, tbnds) - time_bnds	double	-
evspsbl (time, lat, lon) - Evaporation	float	-

Below the metadata table, there is a "Preview" section showing a global map visualization of the evaporation data. The map uses a color scale from blue (low values) to red (high values). A vertical color bar on the right side of the map indicates the scale, with values ranging from 0.0000 to 0.0002. The map shows higher evaporation rates in the tropical regions, particularly over the Amazon basin, the Congo basin, and parts of the Indian Ocean.

At the bottom of the interface, there are three buttons: "Download", "Add to basket", and "Reload".

Processing with Web Processing Services

- Data “placed” in basket
- Data from pasted OpenDAP URL’s
- Result saved in basket

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, regrid 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

Web Processing Services

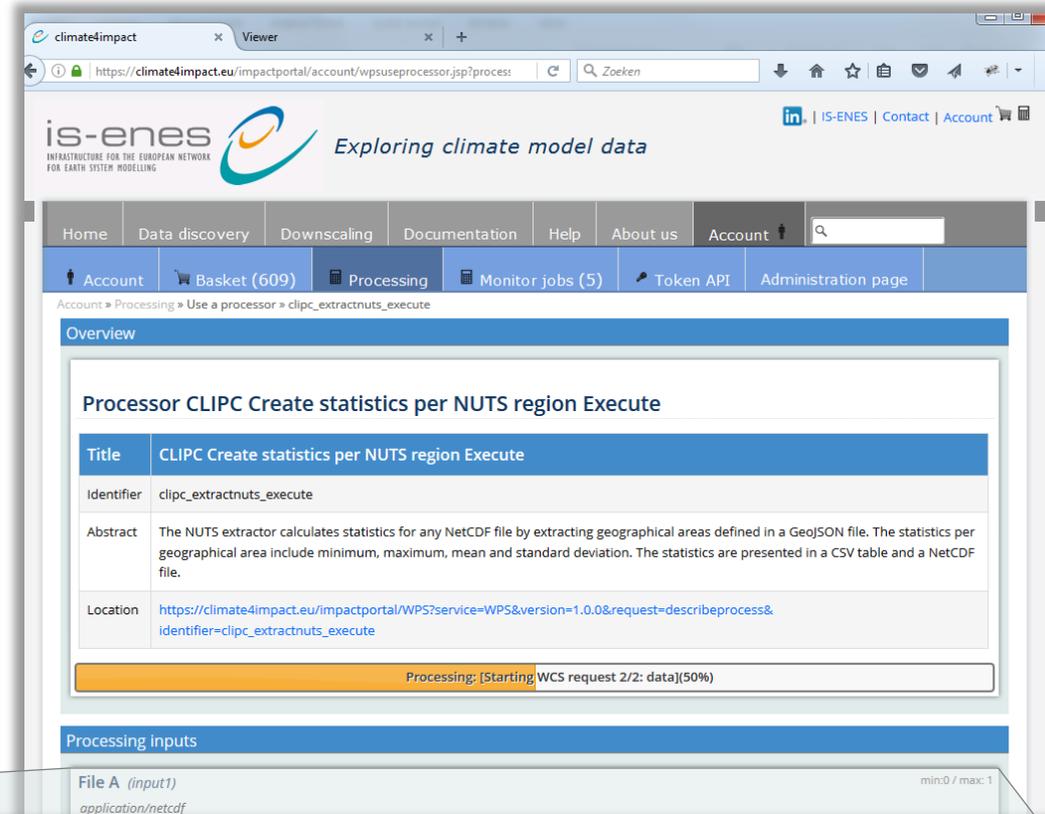
Web processing services are processing services are used by the wizard but can be controlled manually.

Name	Abstract
CLIPC ICCLIM simple indicator calculator Execu...	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.
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.
RangeIndices	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.

[use](#)

Generated processing UI for WPS services

- WPS DescribeProcess → UI
- Lightweight
- Links to preview
- Links to basket / cart
- Reusable & modular



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

basket

preview

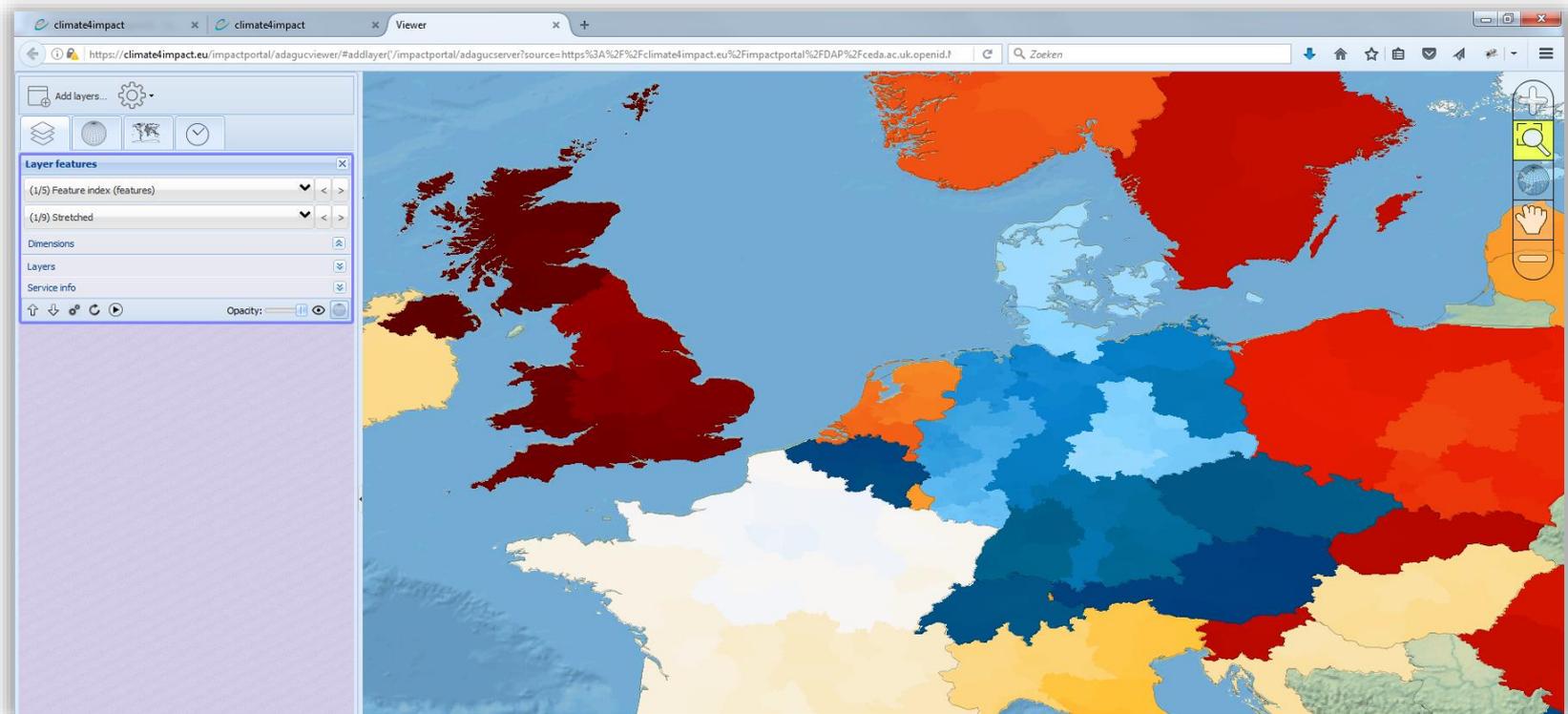
delete

Wizard for subsetting and regridding WPS

- Data reduction
- Subsetting
- GIS formats
- Reprojection
- Regridding

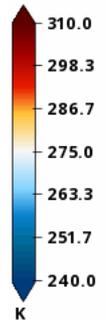
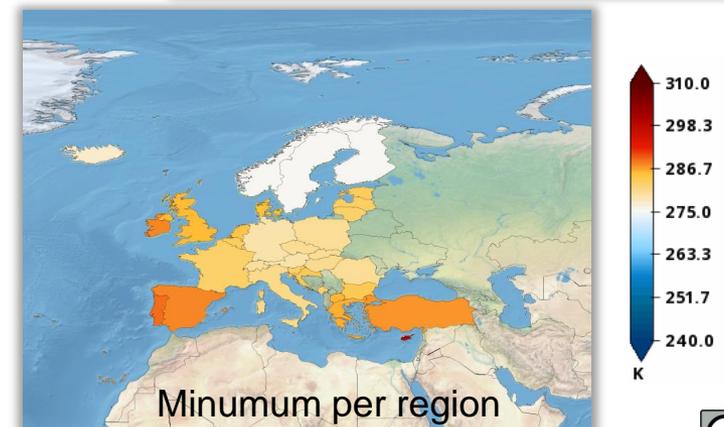
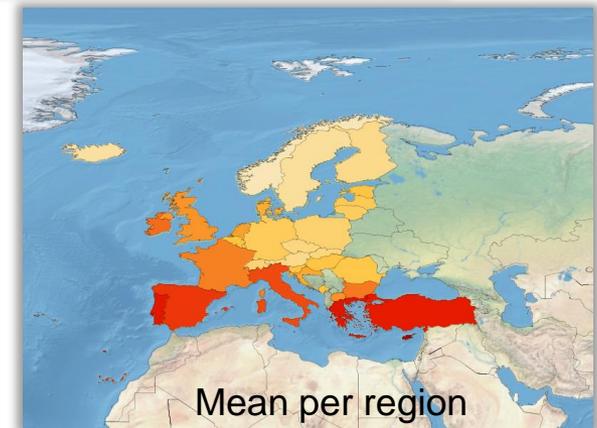
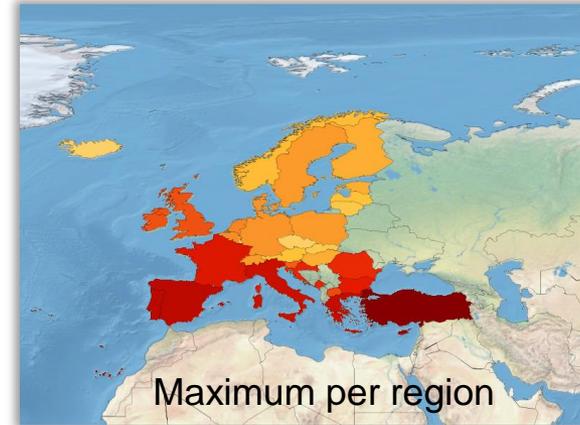
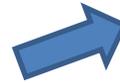
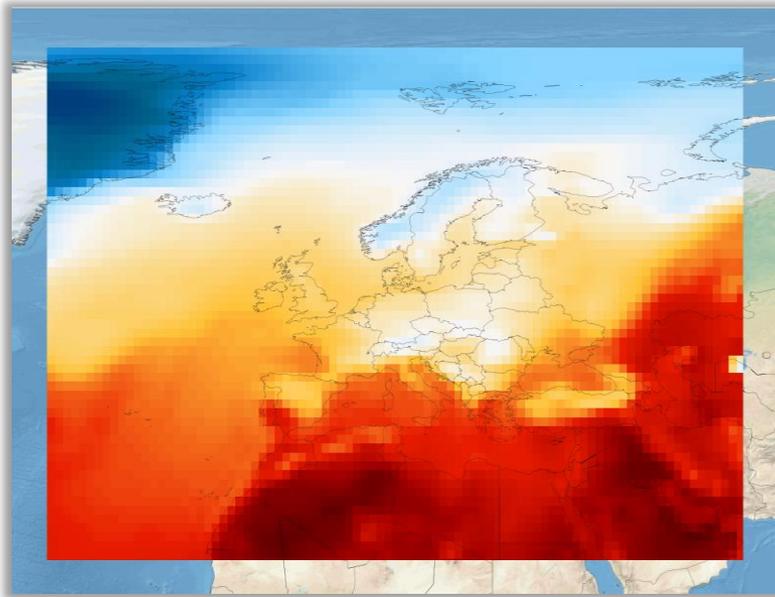
GeoJSON support for polygons via WMS/WCS

- ADAGUC WMS and WCS supports GeoJSON
- GeoJSON can be rasterized to grids using the Web Coverage Service
- The Web Coverage Service is used in Web Processing Services



WPS for statistics per region

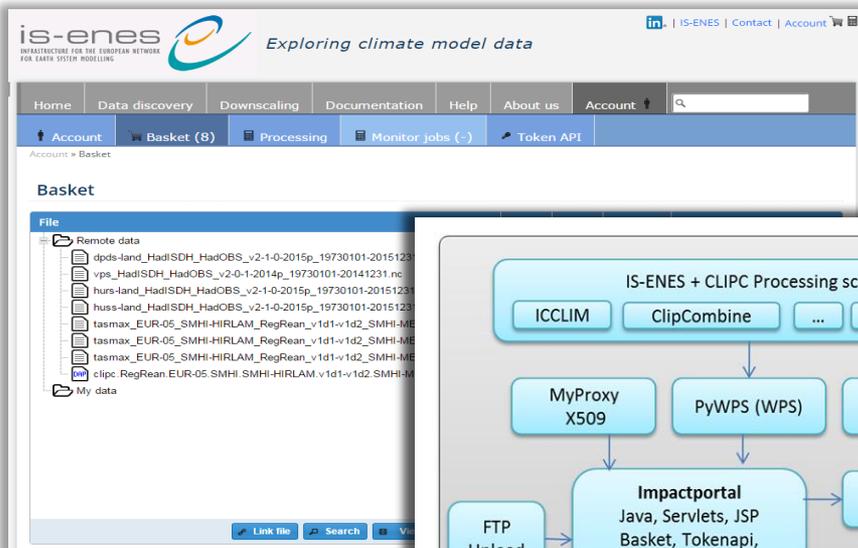
- Calculates statistics per region
- Mean, min, max, etc ...



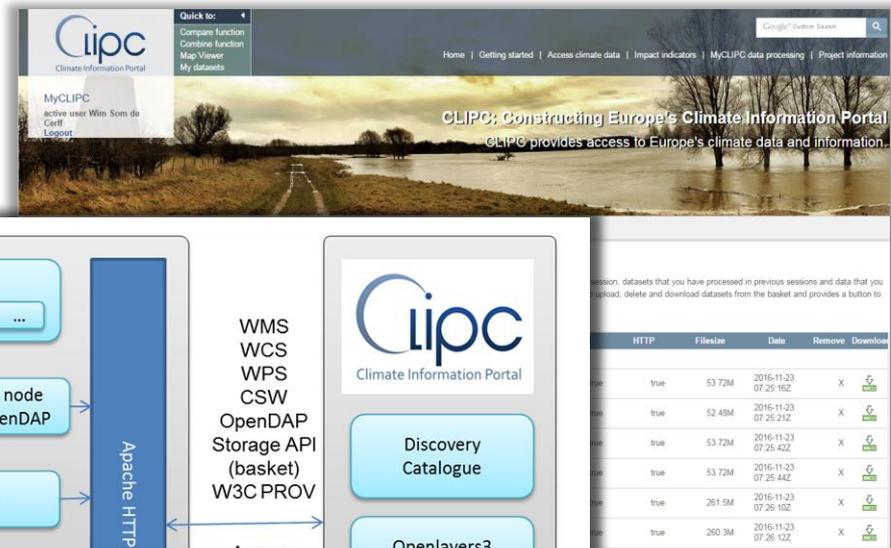
- Outputs CSV table and NetCDF files
- Based on NUTS regions in GeoJSON

CLIPC Portal uses Climate4impact web services

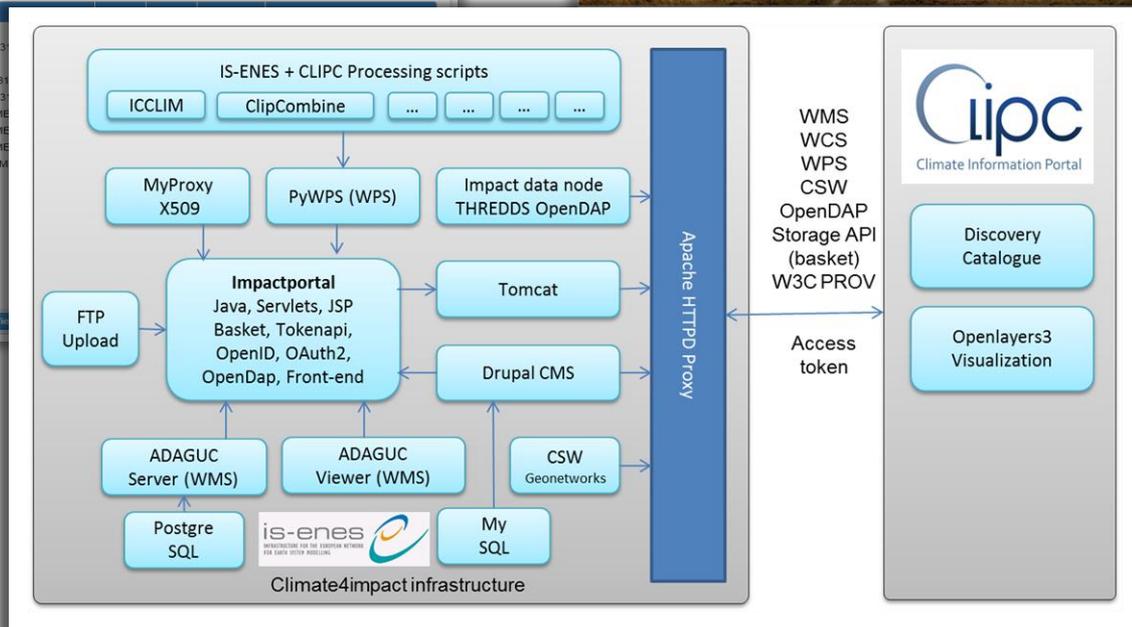
- CLIPC is aimed at boundary workers, C4I is aimed at climate impact researchers
- CLIPC is directly connected to climate4impact (WMS, CSW, WPS, basket api)
- Uses access tokens for authentication (UUID's, 10 hours valid)
- Instruction movies: <http://www.clipc.eu/getting-started/documentation-and-videos>



User basket at Climate4impact portal



User basket at CLIPC portal



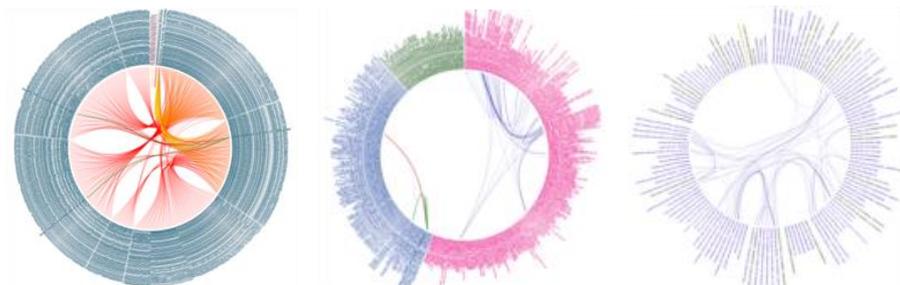
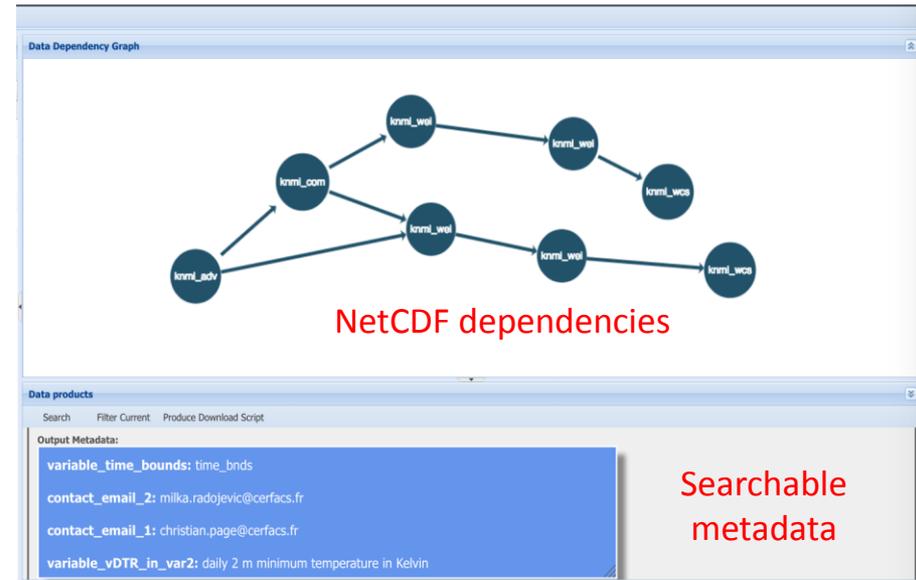
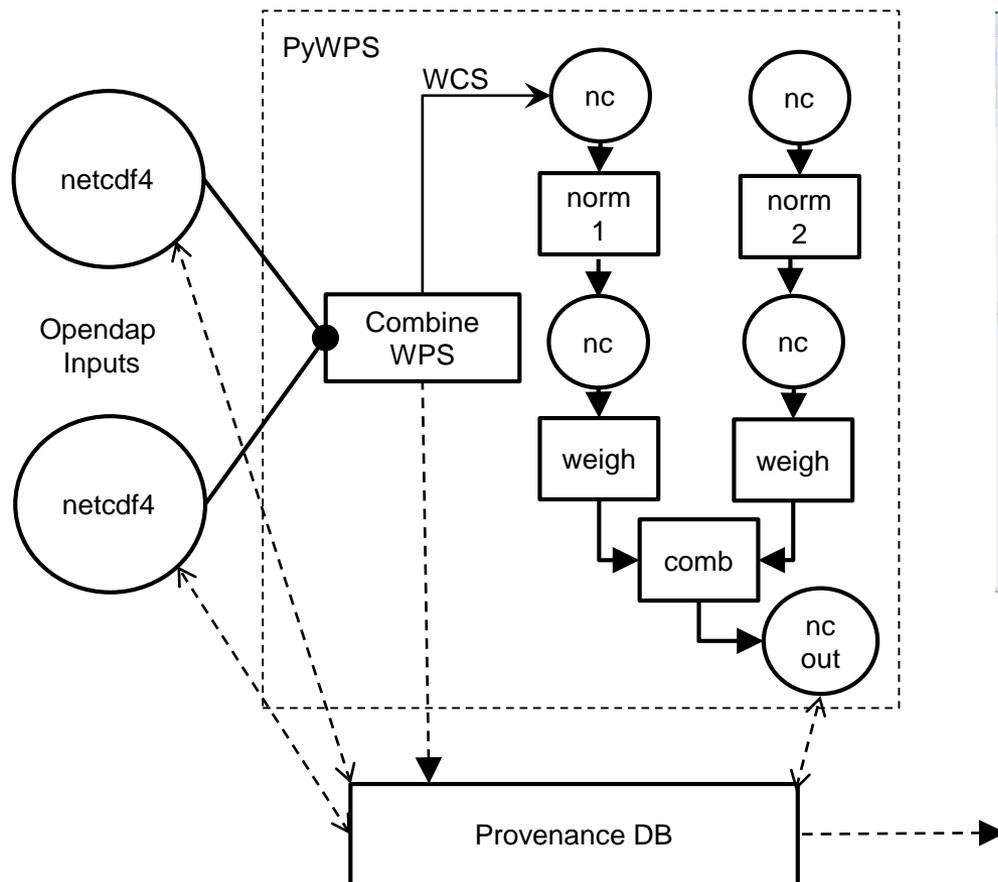
Monitoring and Exploration of WPS workflows via Provenance

Combine WPS, five steps involved

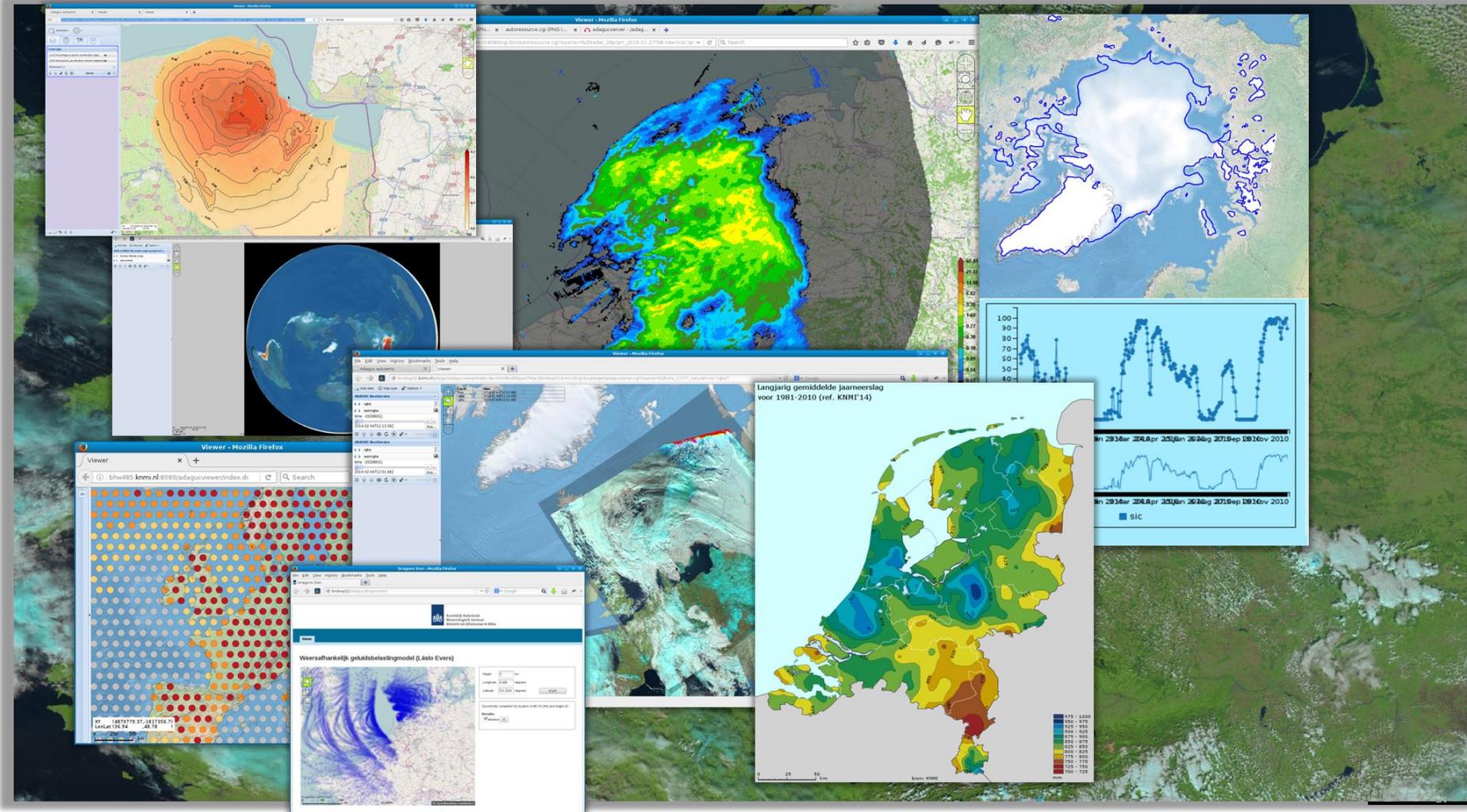
- Provenance module: WPS_PROV
- Provenance metadata is stored in NetCDF
- W3C PROV-DM standard

Visual analytics techniques on provenance

- Highlighting data-reuse, even for cached data
- User interactions
- Exploitation of resources



Thanks for listening!!!



End