

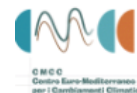
Latest climate4impact developments

Connection to CLIPC Provenance in Processing

CERFACS, [KNMI](#), University of Cantabria, SMHI, Wageningen University & Research, CMCC, STFC, IPSL

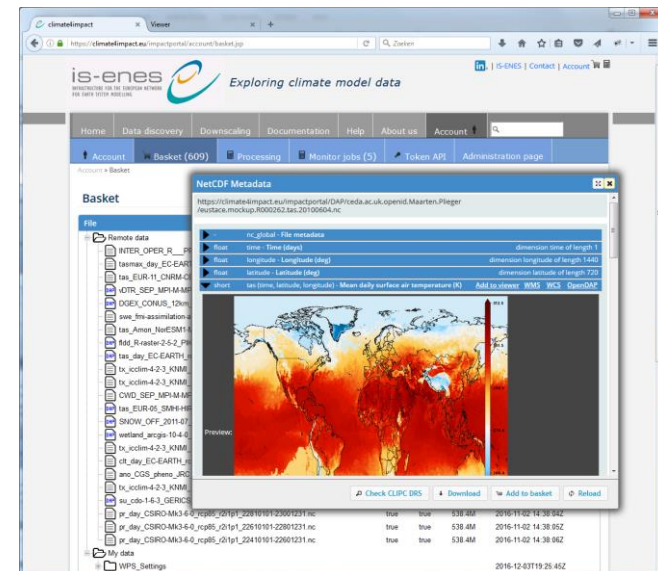
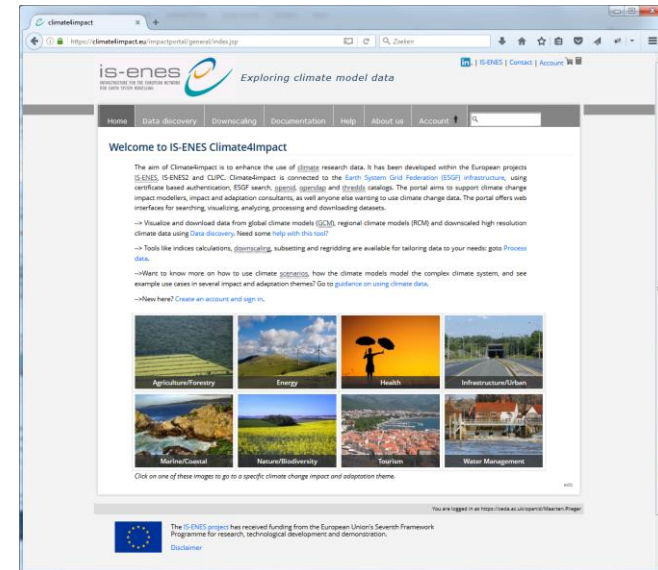
Christian Pagé

Maarten Plieger, Wim Som de Cerff, Ernst de Vreede, Andrej Mihajlovski & Alessandro Spinuso,
Antonio Cofiño & Manuel Vega Saldarriaga,
Lars Barrig
Ronald Hutjes & Fokke de Jong,
Sandro Fiore & Alessandro d' Anca



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)



Improved search UI 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
- Never finished

The screenshot displays the is-enes 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 with the text 'search.jsp#'. The main content area features a 'Filters' section with a 'Quick select Parameter' menu. This menu is organized into several categories, each with a set of checkboxes for selection:

- Temperature:** Temperature (tas), Min. Temperature (tasmin), Max. Temperature (tasmax), Air Temperature (ta)
- Precipitation:** Precip. (pr), Conv. Precip. (prc), Snow (prsn)
- Humidity:** Specific Humidity (huss), Rel. Humidity (hurs), Max. Rel. Humidity, Min. Rel. Humidity (rhsm), Rel. Humidity (rhs), Spec. Humidity (hus), Rel. Humidity (hur)
- Wind:** Wind (sfcWind), Max. Wind (sfcWindmax), E. Wind (uas), N. Wind (vas)
- Radiation:** SW Radiation Dn (rsds), SW Radiation Up (rsus), LW Radiation Dn (rlds), LW Radiation Up (rius), Diff. Radiation Dn (rdsd), Clouds (clt)
- Pressure:** Pressure (ps), SL Pressure (psl), Pressure (pfull)
- Evaporation:** Act. Evap. (evspsbl), Pot. Evap. (evspsblpot), Soil Evap. (evspsblsoi), Canopy Evap. (evspsblveg)

Below the filters, there is a 'Selected filters' section showing 'none'. A summary bar indicates 'Found 672402 datasets. Displaying page 1 of 26897.' with pagination controls and an 'Export to CSV' button. The bottom of the page shows a list of dataset entries, each with a trash icon and the text 'cmip5.CSIRO-BOM.ACCESS1-0.historicalExt.mon.sealce.Olmon.r2i1p1.v1', followed by the 'es-doc' logo.

Improved processing UI for WPS services

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

The screenshot shows the climate4impact web interface. The main content area displays the 'Processor CLIPC Create statistics per NUTS region Execute'. Below the overview, there is a 'Processing inputs' section with a table for 'File A (input1)'. The table has columns for 'title', 'identifier', 'abstract', and 'location'. The 'abstract' column contains the text: '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.' The 'location' column contains a URL: 'https://climate4impact.eu/impactportal/WPS?service=WPS&version=1.0.0&request=describeprocess&identifier=clipc_extractnuts_execute'. Below the table, there is a progress bar indicating 'Processing: [Starting WCS request 2/2: data](50%)'. At the bottom of the 'File A' row, there are three icons: a shopping cart (basket), a document (preview), and a trash can (delete).

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

Improved wizard for subsetting and regridding WPS

Account » Processing » Wizard convert and subset

Convert and subset

Resource
http://aims3.llnl.gov/thredds/dodsC/cmip5_css01_data

Variable
pr

Projection
EPSG:4326

Bounding box
North: 64.6536175441
West: -147.967482636 East: -115.779635416
South: 34.5485133775

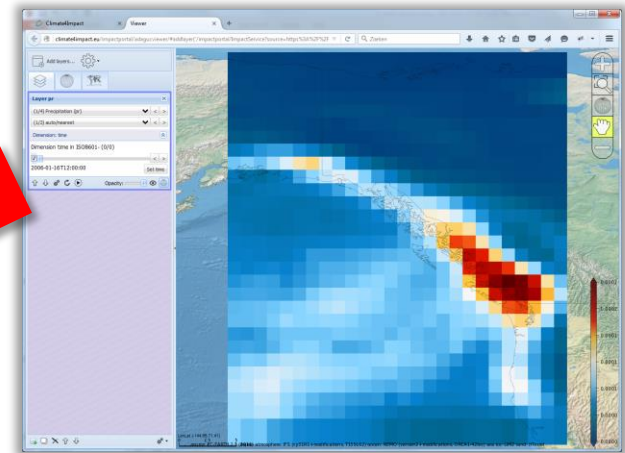
Resolution
Horizontal: 1.125 width: 29
Vertical: 1.121276975 height: 27

Dates
Start date: 2006-01-16T12:00:00
Stop date: 2006-12-16T12:00:00
Time resolution: P1D

Format
netcdf
name
out.nc

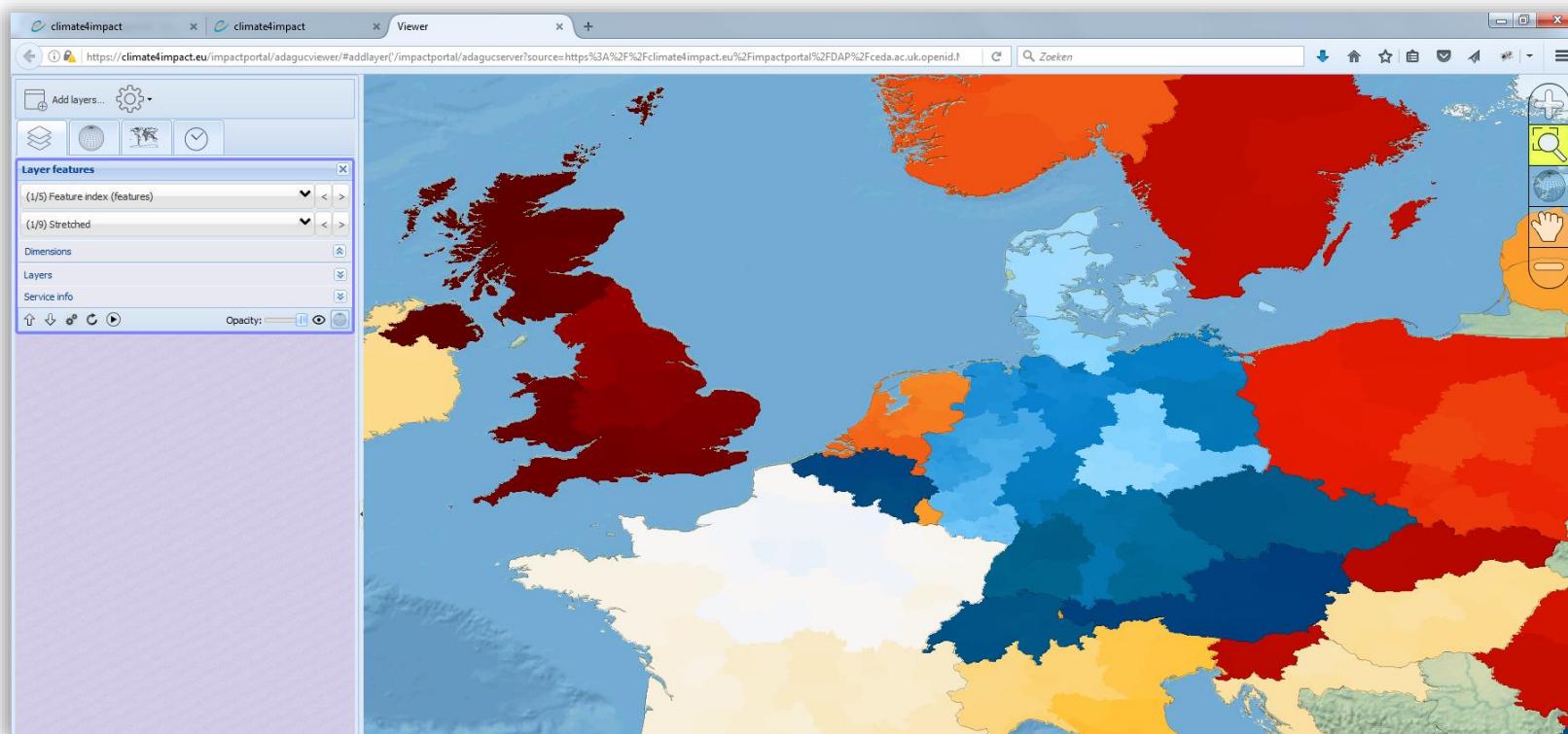
Start processing

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



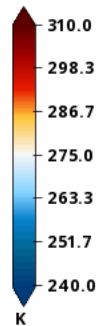
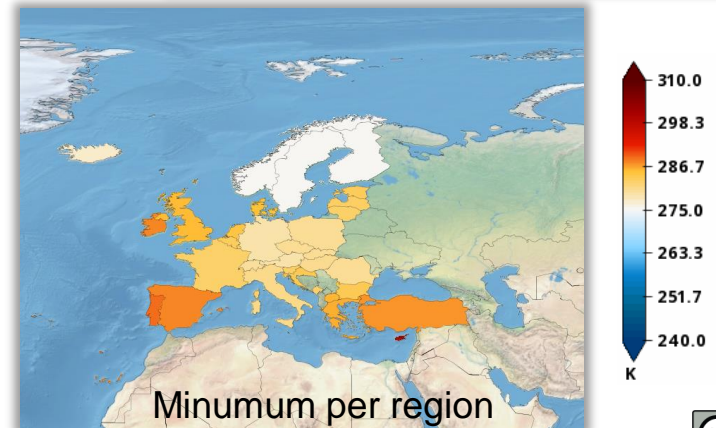
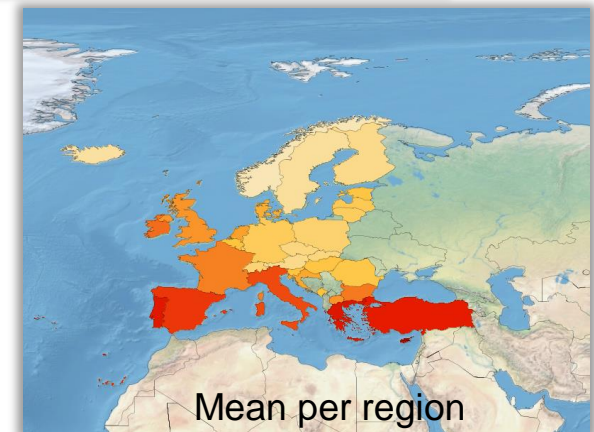
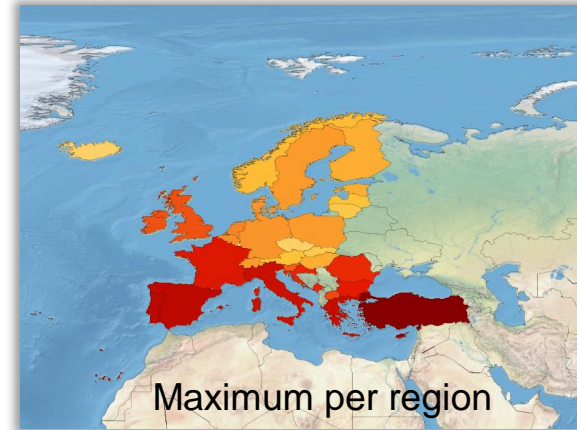
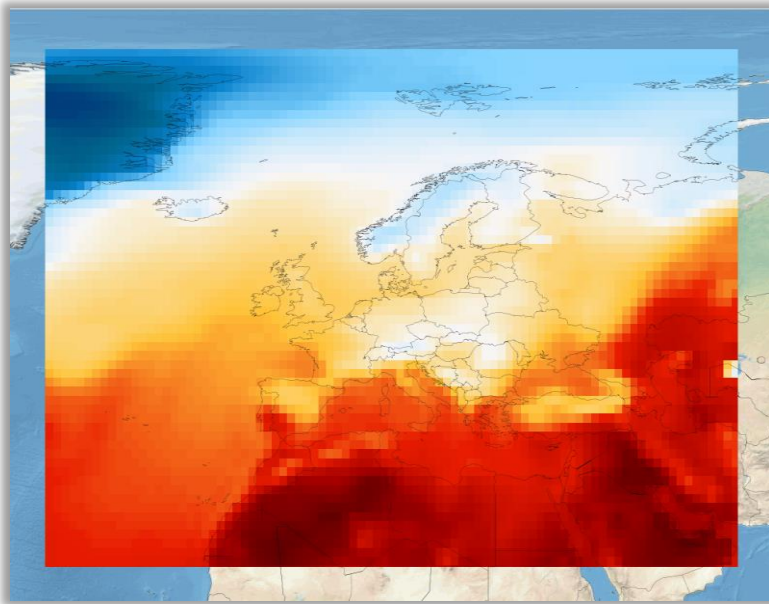
GeoJSON support for polygons via WMS/WCS

- 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

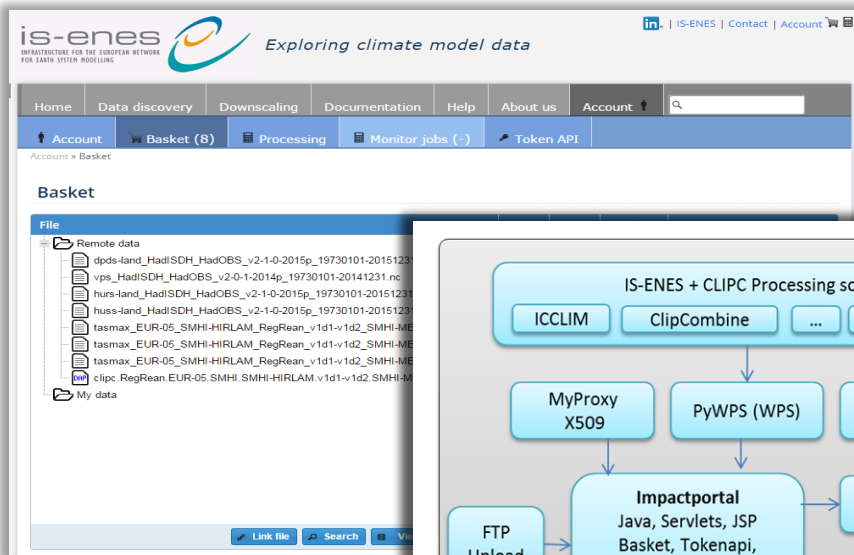
- Calculates statistics per region
- Mean, min, max, etc ...



- 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>

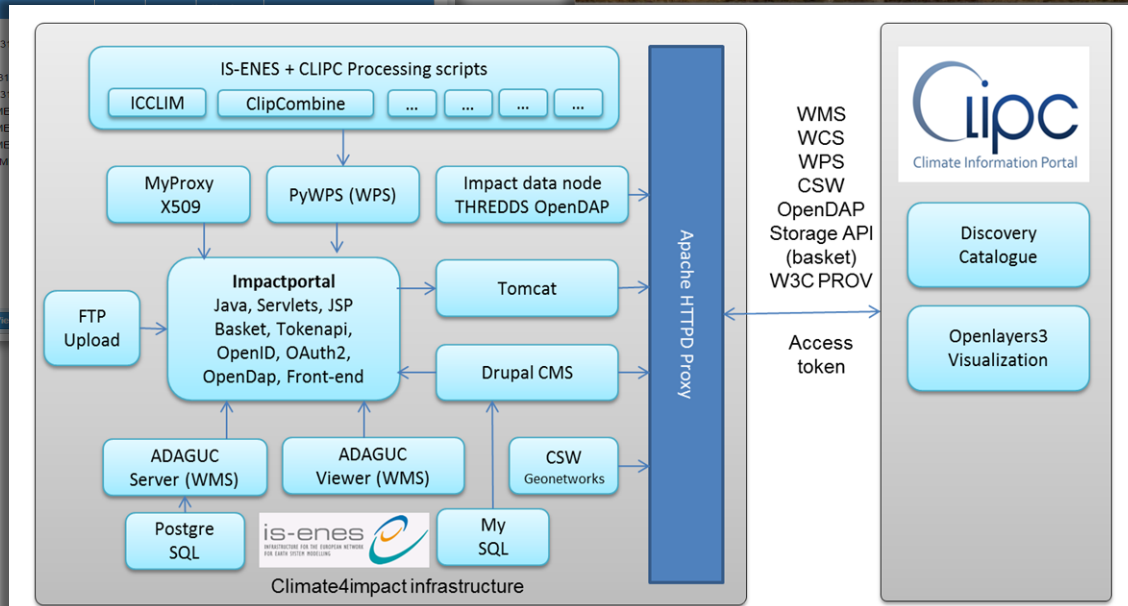


User basket at Climate4impact portal



HTTP	Filesize	Date	Remove	Download
true	53.72M	2016-11-23 07:25:16Z	X	
true	52.48M	2016-11-23 07:25:21Z	X	
true	53.72M	2016-11-23 07:25:42Z	X	
true	53.72M	2016-11-23 07:25:44Z	X	
true	261.5M	2016-11-23 07:26:10Z	X	
true	260.3M	2016-11-23 07:26:12Z	X	

User basket at CLIPC portal



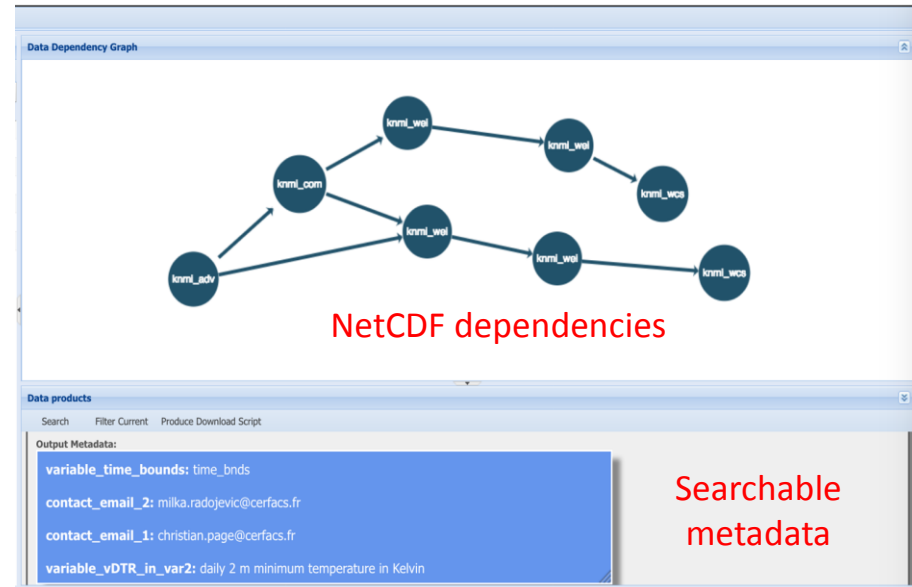
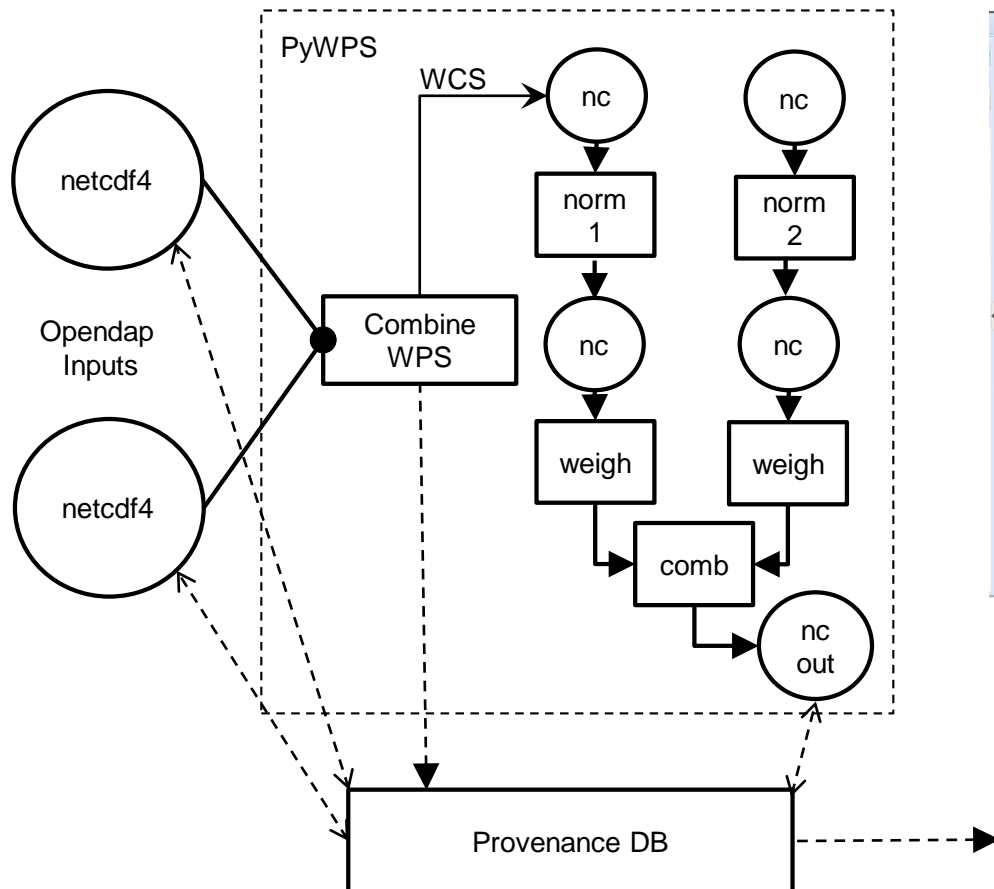
Monitoring and Exploration of WPS workflows via Provenance

Combine WPS, five steps involved

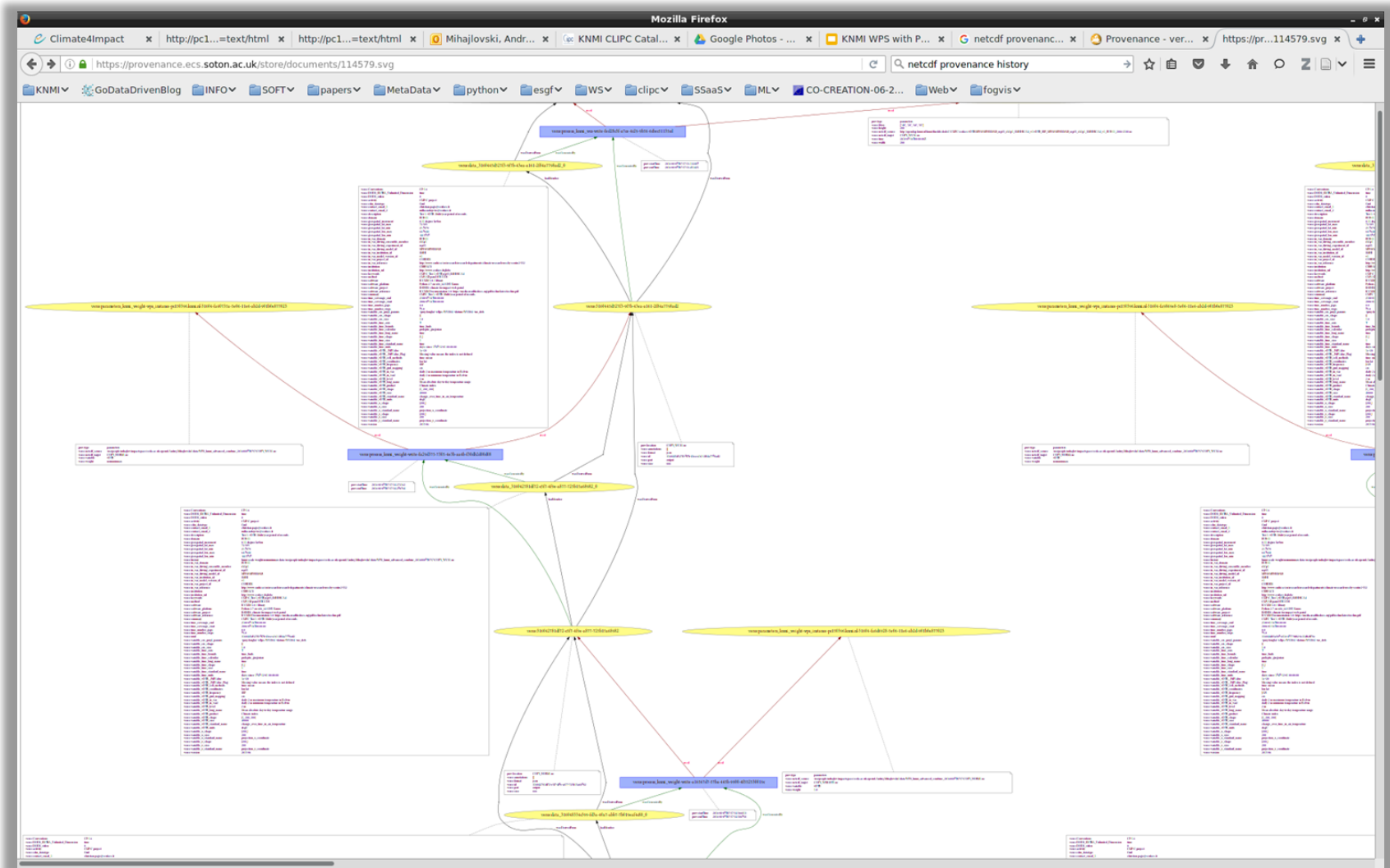
- Provenance module: WPS_PROV
- Provenance metadata is stored in NetCDF
- W3C PROV-DM standard

Visual analytics techniques on provenance

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

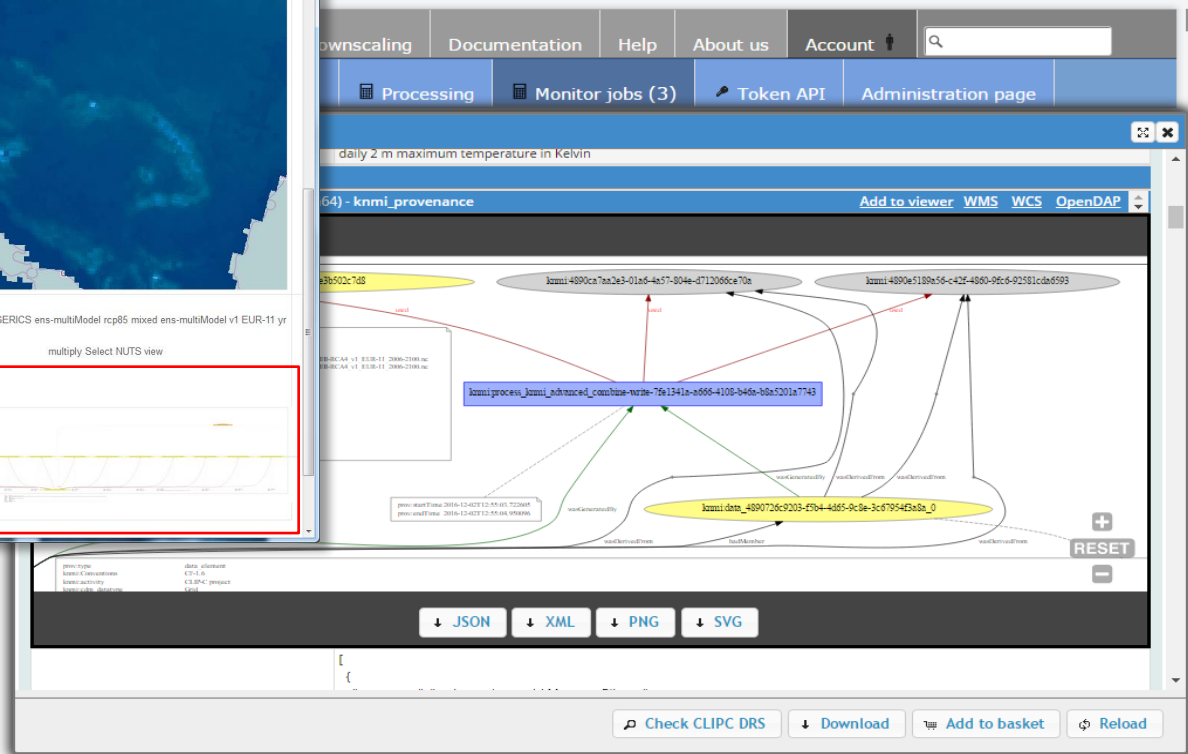
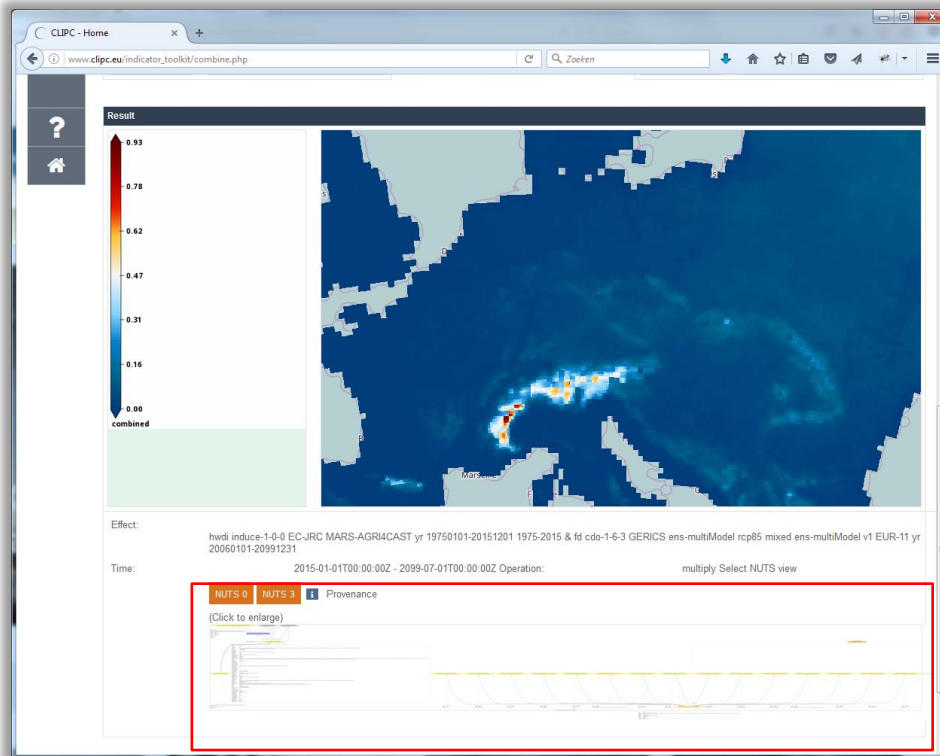


Visualisation of W3C PROV Output from NetCDF



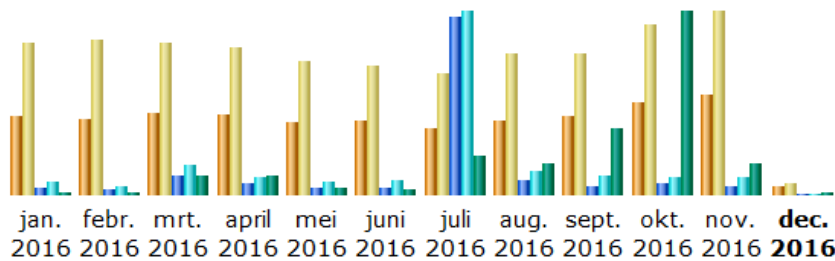
Accessible in Climate4impact portal and CLIPC portal

- Displays SVG graphic created from provenance variable in NetCDF

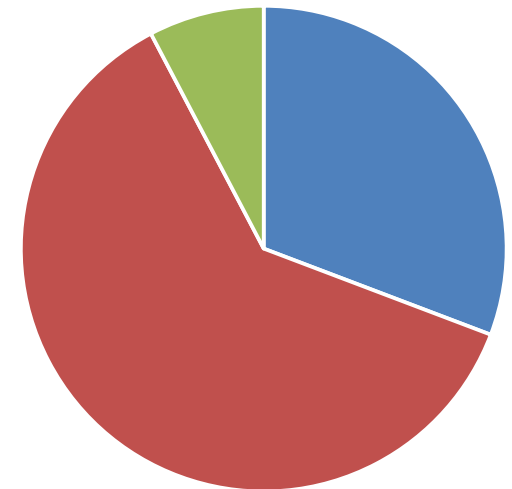


Usage statistics in short:

Climate4impact has currently ~750 registered users



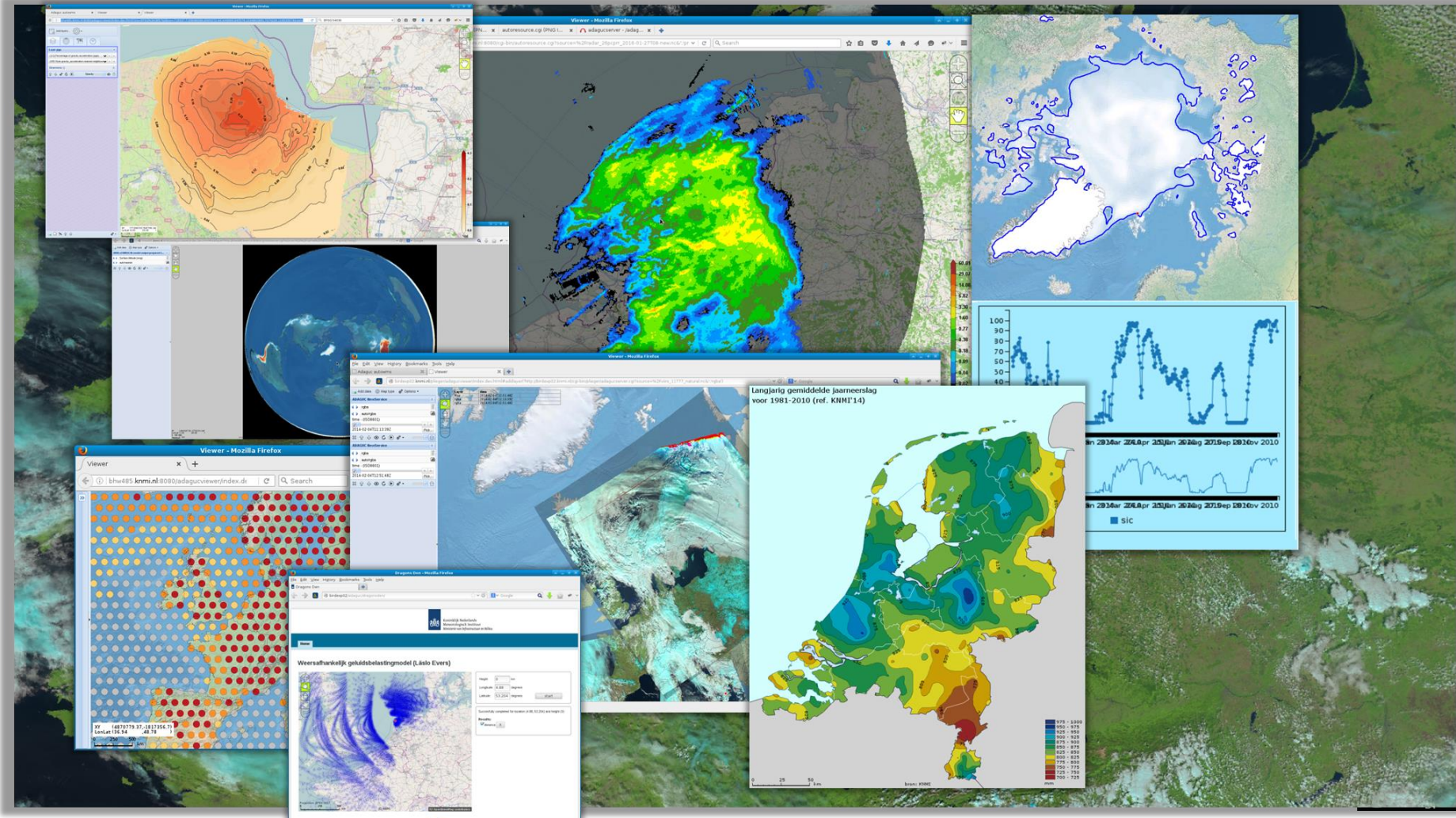
Access to C4I



Maand	Unieke bezoekers	Aantal bezoeken	Pagina's	Hits	Bytes
jan. 2016	1556	3063	193052	319625	4.21 GB
febr. 2016	1547	3113	106549	231020	3.55 GB
mrt. 2016	1652	3044	490162	763530	20.60 GB
april 2016	1633	2959	299685	453191	22.00 GB
mei 2016	1462	2670	192229	334389	6.88 GB
juni 2016	1488	2594	192661	368976	4.84 GB
juli 2016	1332	2427	4516235	4650347	43.40 GB
aug. 2016	1509	2848	373426	576147	33.43 GB
sept. 2016	1592	2852	257662	481896	71.68 GB
okt. 2016	1861	3395	258896	417680	198.58 GB
nov. 2016	2042	3680	254387	422926	34.77 GB
dec. 2016	173	221	31456	51129	2.77 GB
Totaal	17847	32866	7166400	9070856	446.71 GB

- Access tokens
- Browser session
- Certificates

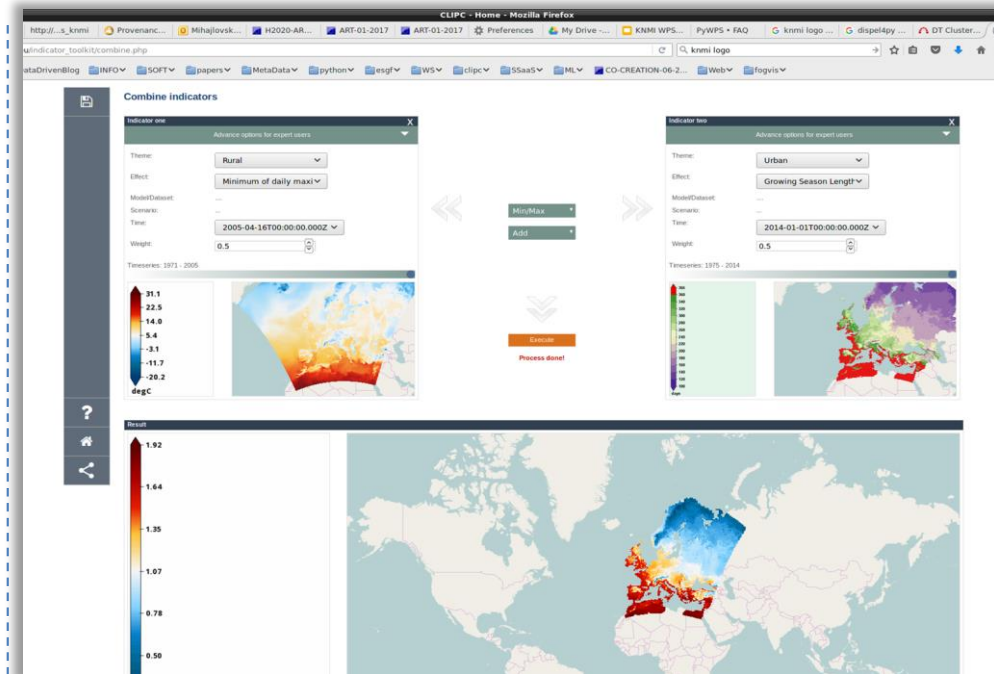
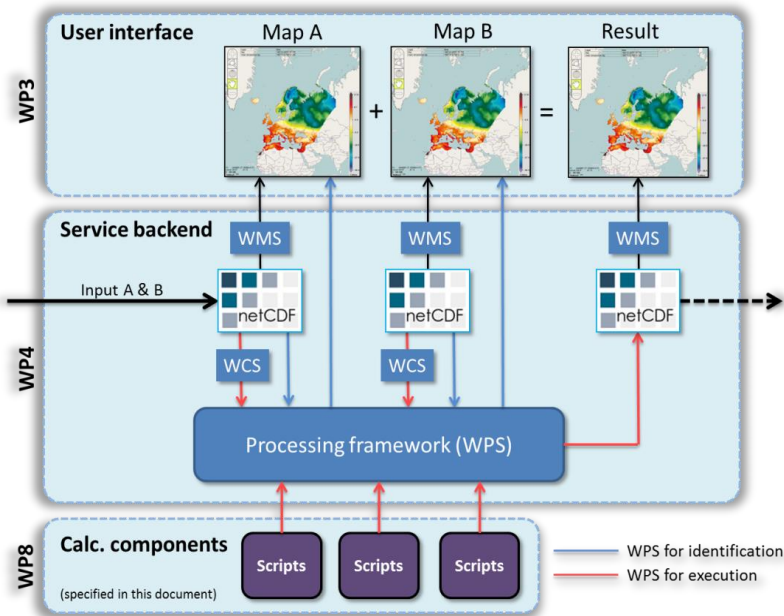
Thanks for listening!!!



End

Provenance in CLIPC WPS combine service

- Combines two maps into a new one: New climate indicators can be made
- Provenance module for WPS: WPS_PROV:
 - Uses W3C PROV-DM standard for reporting in XML
 - Provenance is stored in NetCDF: Standardises attributes and variable as storage containers of provenance



Monitoring and Exploration of WPS workflows via Provenance

Results | iRods

Run activity monitor - RDWD_knmi_advanced_combine-e76e1a81-7ab2-47...

ID	Date	Messages
1	knmi_advanced_combine...	2016-08-22 08:25:46.84...
2	knmi_combine-write-1b8...	2016-08-22 08:25:46.56...
3	knmi_weight-write-4f28d...	2016-08-22 08:25:46.22...
4	knmi_weight-write-8457f...	2016-08-22 08:25:45.92...
5	knmi_weight-write-35845...	2016-08-22 08:25:45.61...
6	knmi_weight-write-b983c...	2016-08-22 08:25:45.25...
7	knmi_wcs-write-a9b0e6e...	2016-08-22 08:25:44.95...
8	knmi_wcs-write-8be4c70...	2016-08-22 08:25:44.23...

Data Dependency Graph

Data products

Search | Filter Current | Produce Download Script

Output Metadata:

- variable_time_bounds: time_bnds
- contact_email_2: milka.radojevic@cerfacs.fr
- contact_email_1: christian.page@cerfacs.fr
- variable_vDTR_in_var2: daily 2 m minimum temperature in Kelvin

WPS Runtime Monitoring

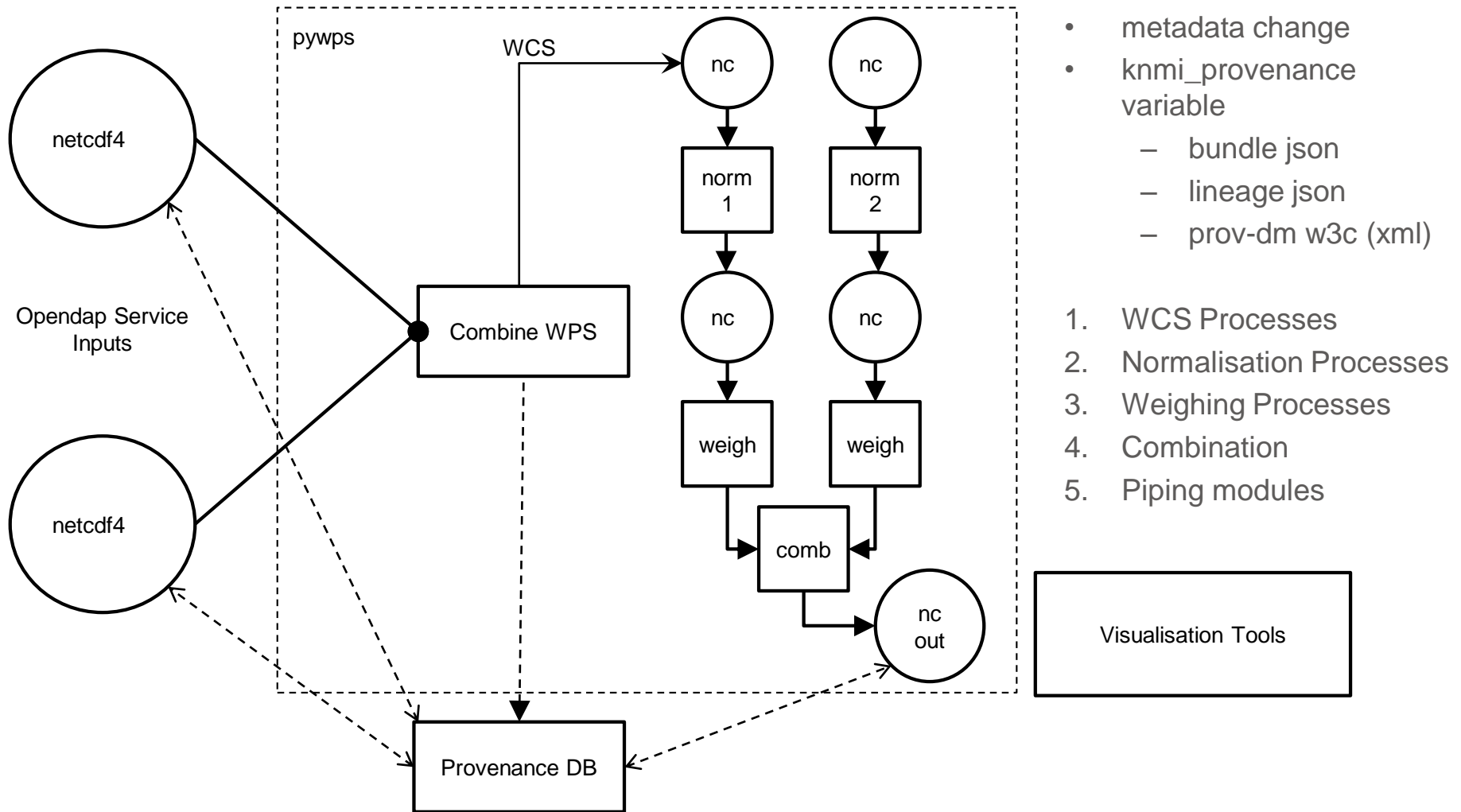
NetCDF dependencies

Searchable metadata



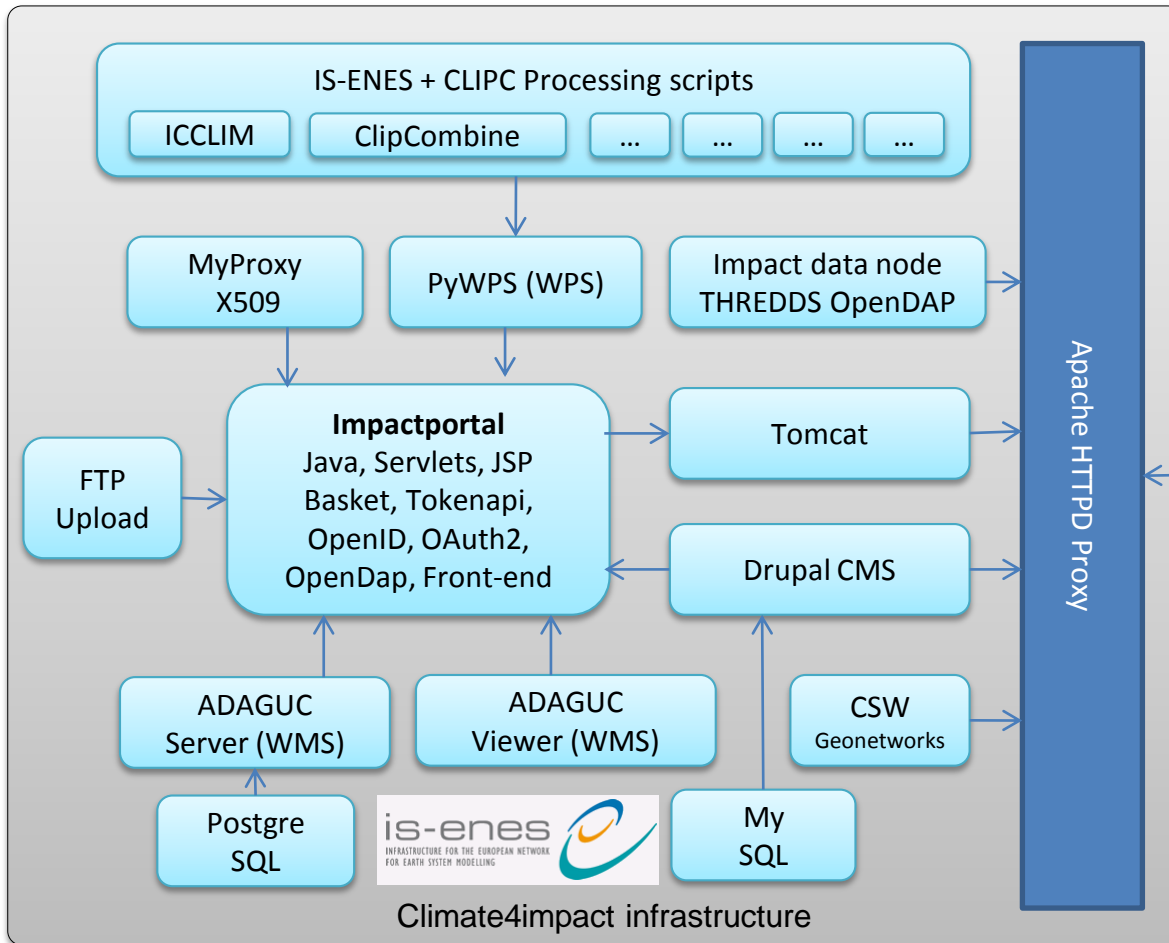
Visual analytics techniques on provenance data, highlighting data-reuse, users interactions, exploitation of resources..

Combine WPS: Five steps involved

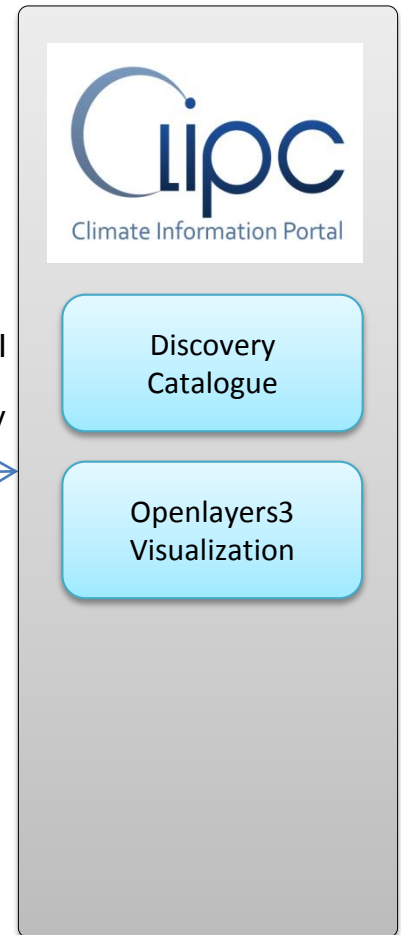


CLIPC Portal connected to climate4impact

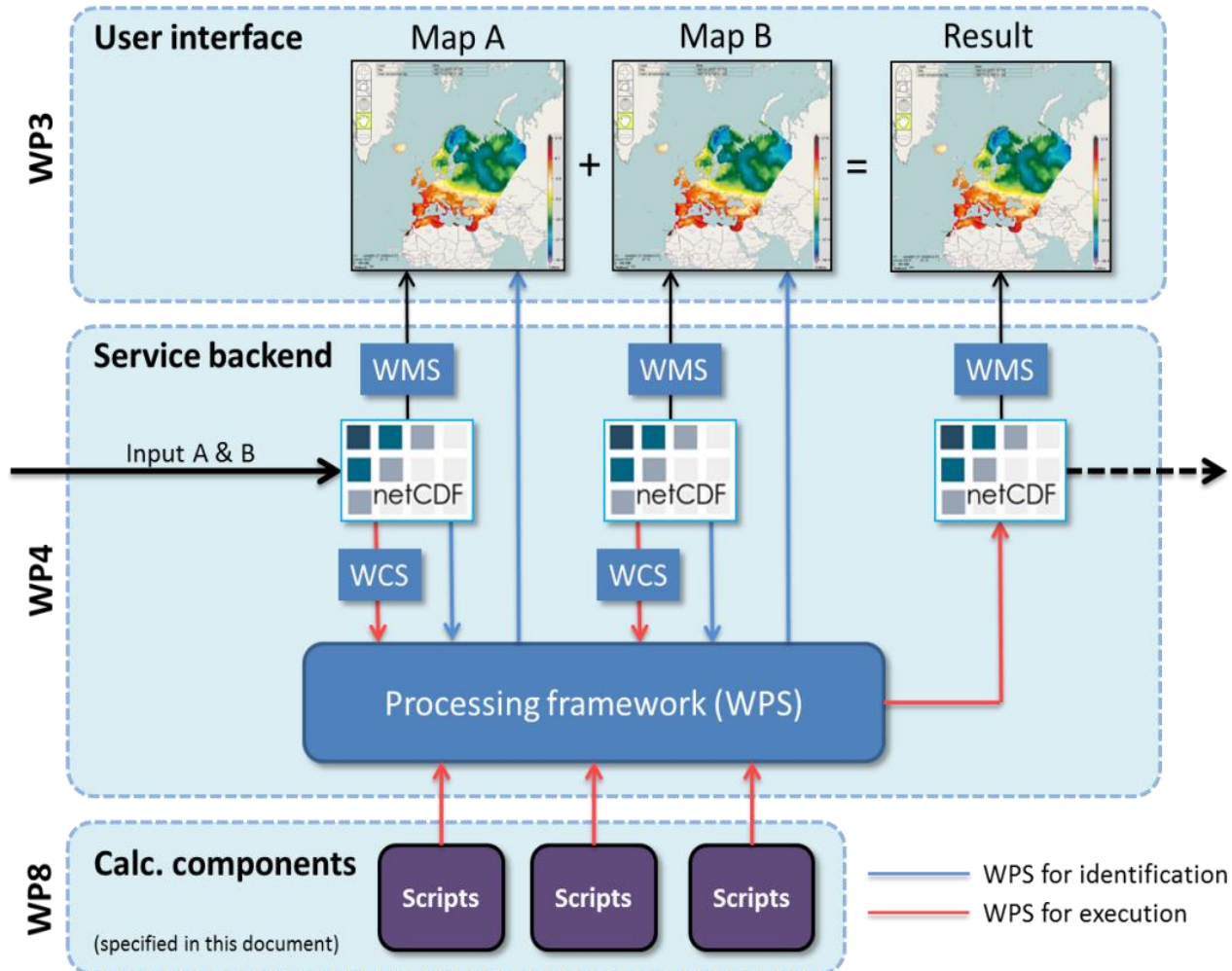
Climate4impact backend services



CLIPC frontend



Combine architecture: File A + File B = Result



WMS	/impactportal/adagucserver/<accesstoken>/?source=<opendapurl>&service=WMS&request=GetCapabilities
WCS	/impactportal/adagucserver/<accesstoken>/?source=<opendapurl>&service=WCS&request=GetCapabilities
WPS	/impactportal/WPS/<accesstoken>/?service=WMS&request=GetCapabilities
OpenDAP	/impactportal/DAP/<accesstoken>/<userid>/<file>
HTTP download	/impactportal/DAP/<accesstoken>/<userid>/<file>