Objective 3: Exploitation of Earth System Models

General talk: Copernicus and C4I portal

CERFACS: Christian Pagé

KNMI: Wim Som de Cerff, Maarten Plieger
DKRZ: Stephan Kindermann
SMHI: Lars Bärring
UKRI: Martin Juckes
CNRS-IPSL: Sébastien Denvil

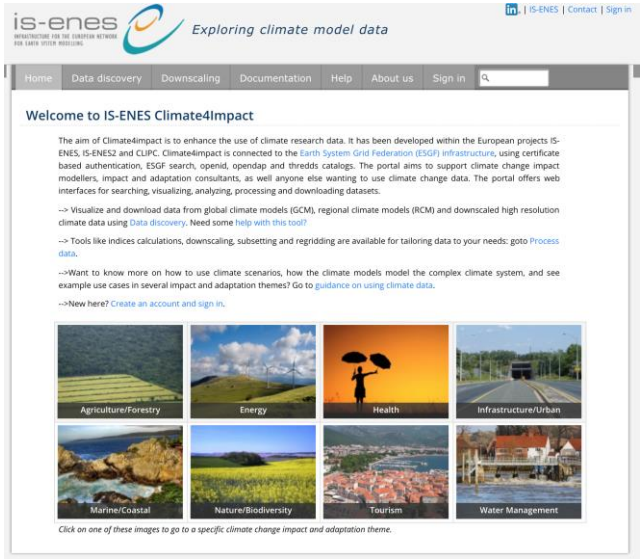
"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824084".

Overview

- C4I Platform
  - Current Status
  - Related projects
  - IS-ENES3 C4I developments

- C3S IS-ENES Activities (Previous and Planned)

- Links between C3S and C4I Activities

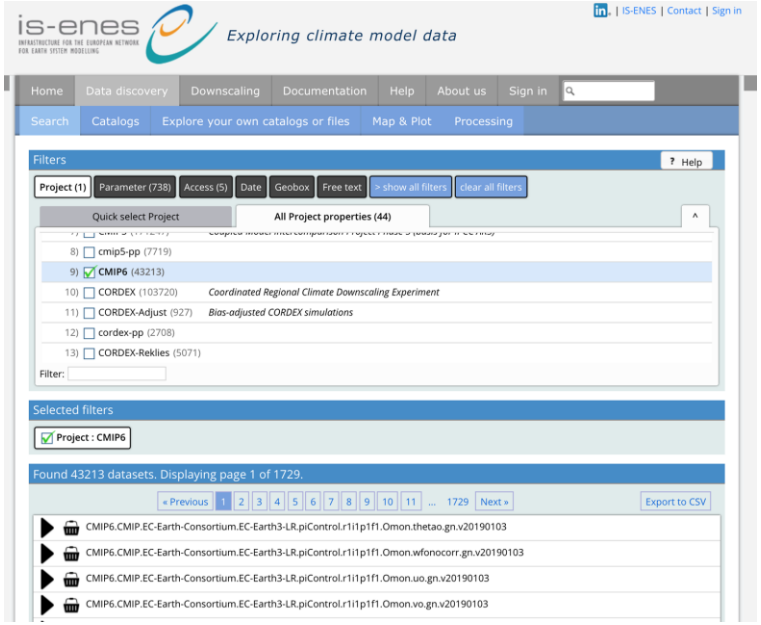


https://climate4impact.eu

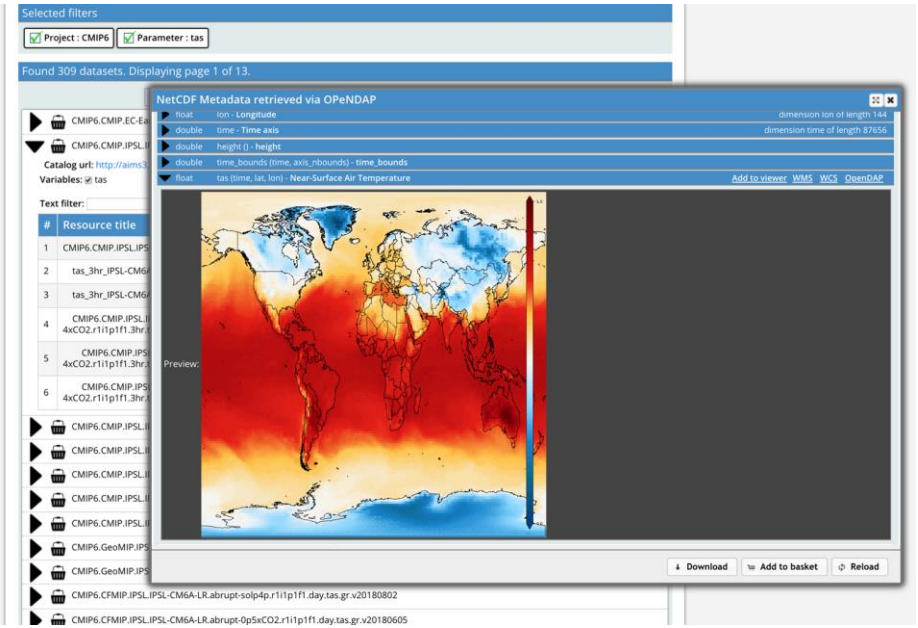
C4I Platform: Current Status

C4I Status

- CMIP6 data findable and can be processed (ICCLIM, subsetting)
- Hardware failure in October 2018 (downtime)
- Migrated to AWS, will be moved to SurfSara
- MyProxy replaced by OAUTH2 with certificates
- Average of 2.100 unique users each month (AWStats)

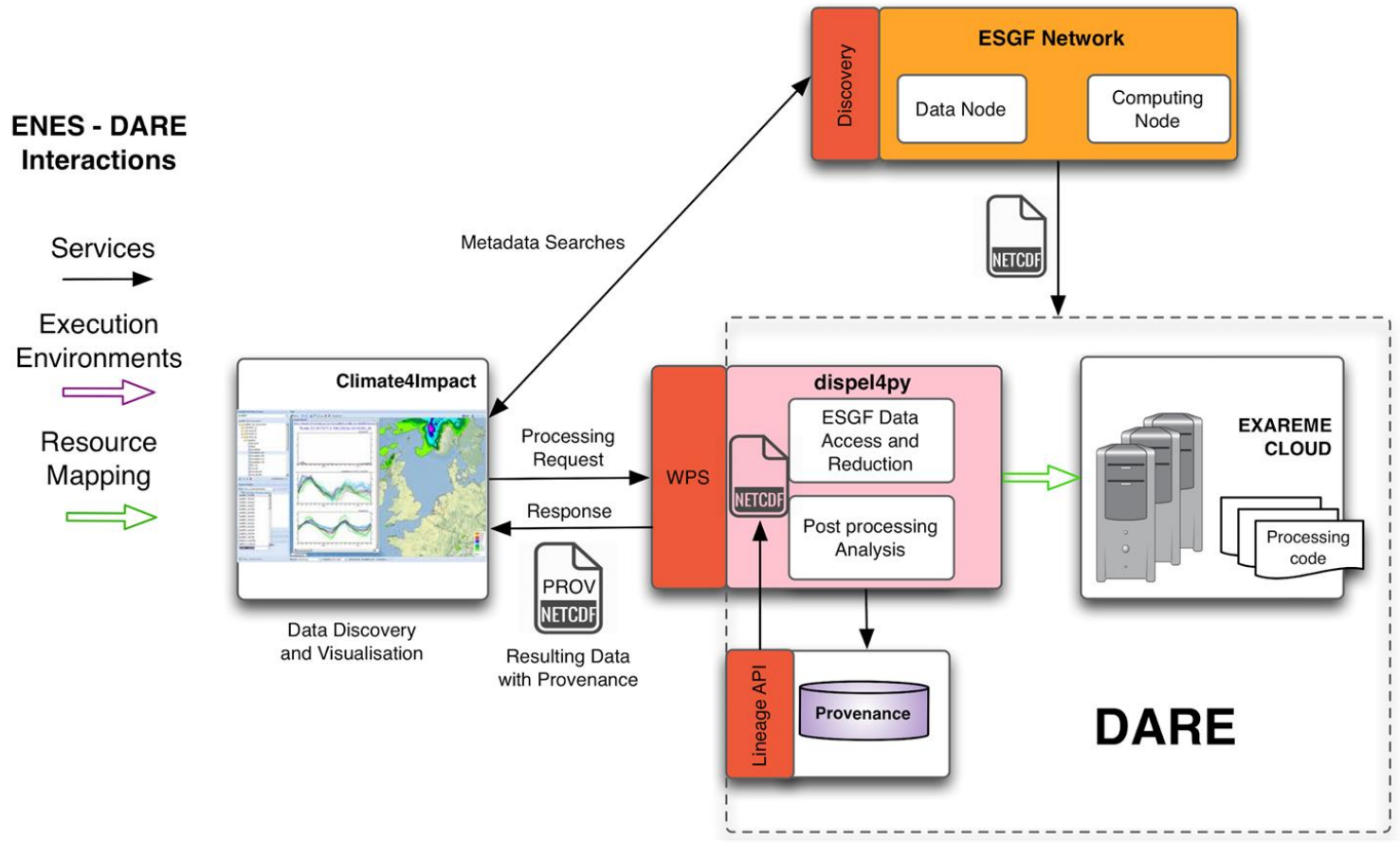


Search showing CMIP6 data



Visualization of CMIP6 data

H2020-DARE: 01/18-12/20



Planned C4I Tasks in IS-ENES3

- Task in WP3, WP7 and WP10 (virtual WP….)
  - WP3: Community building, standards (metadata), requirements
  - WP7: Operational C4I service
  - WP10: Developments of C4I

Goals

- Users' engagement: climate research community, climate impact community as well as interdisciplinary research community
- Make all ESGF climate model data and services (CMIPs, CORDEX) accessible
- Separate computing and portal infrastructure
- Provide advanced data processing and new user-friendly interfaces for data analytics

C3S IS-ENES activities in C3S: Copernicus portal

https://climate.copernicus.eu/

Climate Data Store

- ECVs past, present and future
- Observed, reanalysed and simulated
- Derived climate indicators

Sectoral Information System

Evaluation and Quality Control

- Monitors quality of C3S products and services
- Ensures C3S delivers state-of-the-art climate information to end-users

Outreach and Dissemination

- Web content
- Public outreach

C3S IS-ENES activities in C3S: Simulations available from the CDS

- **Global projections** [from CMIP-5 Core and Tier-1 simulations]
  - Pre-industrial control with prescribed, non-evolving concentrations of atmospheric gases and aerosols;
  - Historical ensemble, 1850 to at least 2005, imposed changing concentrations and forcings, minimum of 3-member ensemble [Tier-1];
  - AMIP ensemble, 1979 to at least 2008, prescribed SST and sea-ice concentration, other forcings as in Historical ensemble above, minimum of 3-member ensemble [Tier-1];
  - Projections following RCP 4.5 and 8.5 concentration scenarios, years 2006-2100, **preferably from models with multi-member ensembles**
  - Optionally: Projection following RCP 2.6 and 6.0 emission scenario, years 2006-2100, **preferably from models with a 3-member ensemble**

- **Regional projections:**
  - Existing simulations from the Euro-CORDEX and Med-CORDEX projects
  - New CORDEX simulations for a pan-European domain based on an agreed “3-D matrix” of regional climate models, boundary conditions from global models, concentration scenarios (RCPs)

C3S IS-ENES activities in C3S

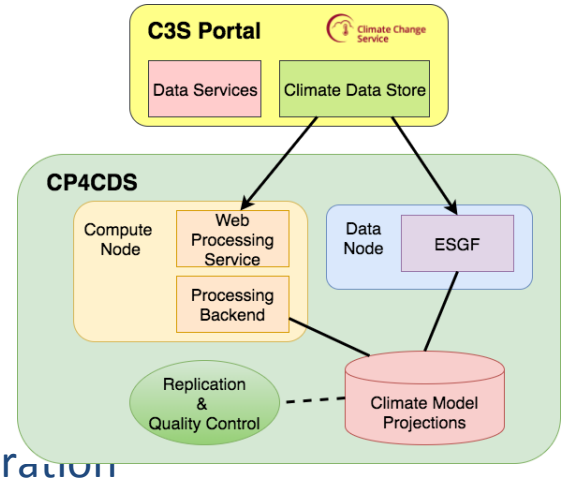
IS-ENES provides backbone services for C3S for climate data

7 projects by IS-ENES3 partners in C3S:

- CP4CDS
- CORDEX4CDS
- C3S MAGIC
- CRECP Roadmap towards a reference set of climate projections for Europe
- PRINCIPLES
- DECM: Data evaluation for climate models
- C3S 512

Relevant for C4I development shortly explained on next slides

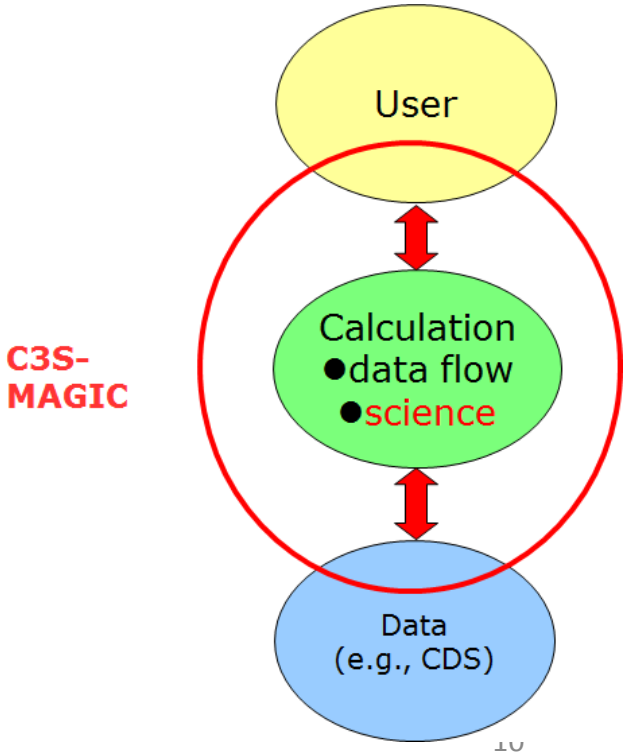
C3S IS-ENES activities in C3S



- **CP4CDS:** (CEDA, DKRZ, CNRS)
  - Focus: provide quality controlled subset of CMIP5 data for the CDS
  - Technical focus:
    - ESGF node interfaces integration
    - compute node development. MAGIC code integration
    - high availability load balanced service provisioning

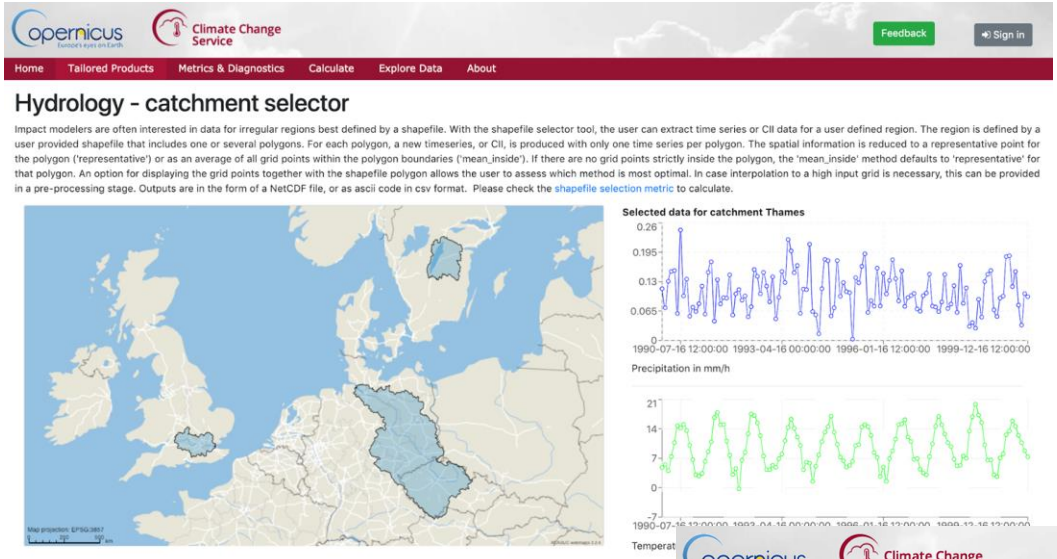
- **CORDEX4CDS** (IPSL, DKRZ, CEDA)
  - Focus: build on CP4CDS to support CORDEX
  - Technical focus
    - Compute services to interpolate regional grids
    - Compute services to ease access to CMIP boundary conditions

- **C3S MAGIC** (KNMI, DLR, NLeSC, BSC, ISAC-CNR, UREAD-NCAS, SMHI)
  - Focus: Software for calculating standardized characteristics (metrics, statistics, time series) from CMIP5 data
  - Technical focus:
    - 'Containerization' of C4I
    - New user interface (previews)
    - Workflow
    - Integration of metrics
    - Integration of Birdhouse WPS
    - Enhanced ESMValtool (2.0)

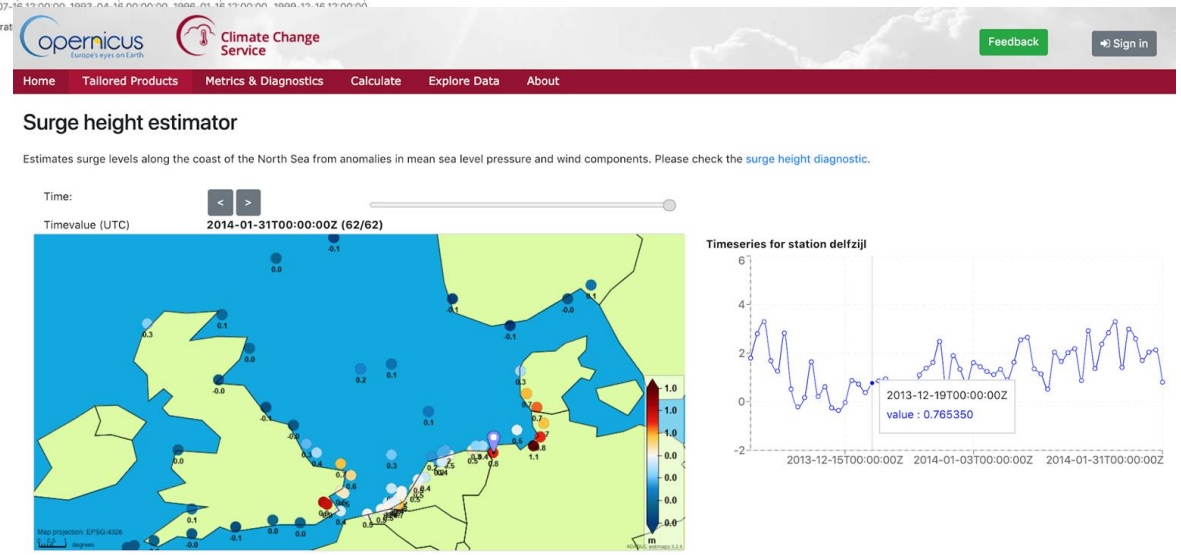


https://portal.c3s-magic.eu/

MAGIC Tailored product page - using reusable components

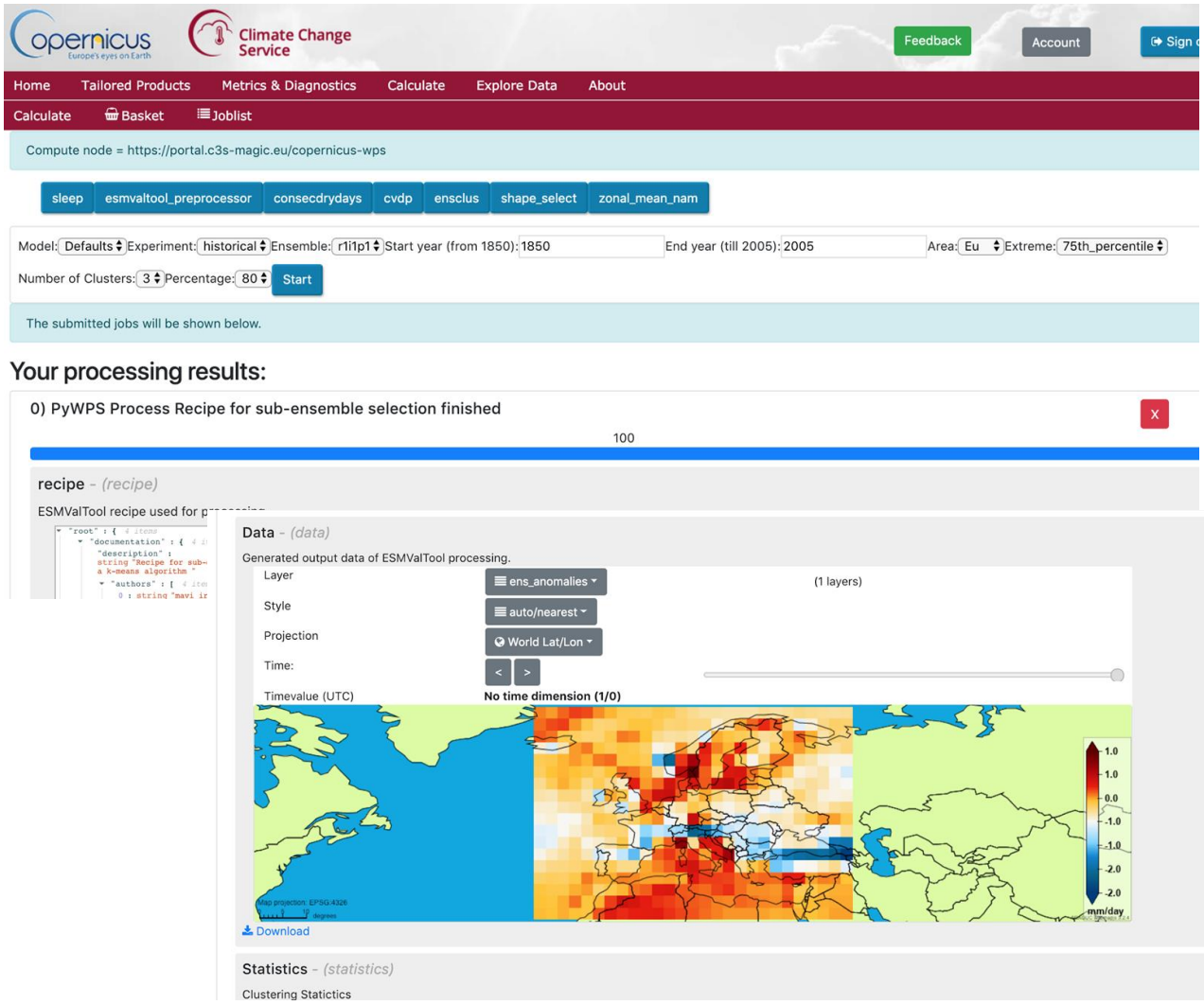


Components like mapping, graphs and page structure will be reused for new setup of C4I



C3S IS-ENES activities in C3S

MAGIC Calculation page - using reusable components



Calculations through WPS version of ESMValtool

Output accessible for the user (recipe, log file, output plots, data and tarball wil all outputs)

User-oriented climate indices in C4I

Frequently users request [tailored] climate indices

- Core set of indices well established through WCRP & WMO Expert Teams
- Widely used, e.g. in IPCC assessment cycles
- C4I implements all core indices, and more
- A key component of many/most C3S Sectoral Information System (SIS) projects

Consistent metadata description is currently lacking

- Different data services provide inconsistent/insufficient metadata
- Hampers streamlined publication and data fusion for high-level analyses and interpretation
- Has been identified as and issue in several C3S/SIS project (--> ad hoc "solutions")

IS-ENES-3 activities

- Build on existing CF Conventions machinery to define metadata for core indices
- Technical expert workshop to explore possibilities to extend CF Conventions or provide/suggest extensions, and identify outstanding issues (WP3/NA2)
- Interaction with user communities (WP3/NA2)
- Implement the metadata standard in ICCLIM and C4I (WP10/JRA3)

What do users gain from C3S?

- **Improved reliability** in the access to climate projection data through the Climate Data Store
- **Products computed** from **models** which show **good fidelity** in the simulation of climate during the recent decades (as quantified by appropriate **metrics**)
- Improved **estimates of uncertainties** allowed by focusing on models that provide ensemble simulations of individual scenarios
- **User defined indices and products** tailored to specific application sectors
- **Quality and usability of products tested** by an Evaluation and Quality Control consortium

Summary & Discussions

- **C4I**
  - Focus making all ESGF climate model data (CMIP, CORDEX) available for climate research community, climate impact community as well as interdisciplinary research community
    - Tailored tools and visualizations
    - WPS processing (birdhouse pyWPS), interactive and batch
    - Userspace for storing results, which can be shared
    - Science/research community focus
    - Metadata Standards developed for new products (indices, …)

- **C3S**
  - Provide authoritative information about the past, present and future climate, as well as tools to enable climate change mitigation and adaptation strategies by policy makers and businesses.
    - Quality controlled climate data
    - Subset of CMIP/CORDEX
    - Generic toolkit, interactive usage
    - Industry/policy focus

Summary & Discussions

- **ESGF & C3S**
  - Currently provide data services linking C3S to CMIP5 data;
  - Data and services are parallel to global ESGF federation … duplication of resources;
  - CP4CDS funding does not cover hardware costs incurred;
  - Can we reduce duplication of effort here?

    -- Option A: deliver data instead of services (C3S now has storage) …

    + simplify interface to C3S;

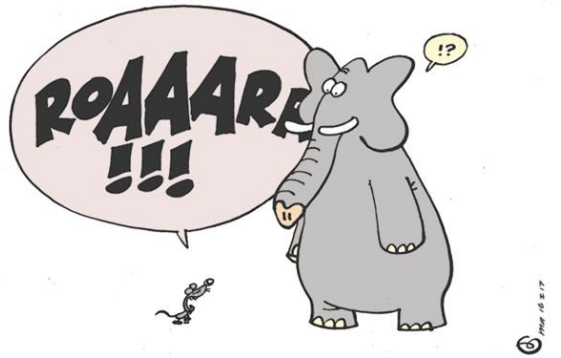
    - creates barrier to future integration of services;

    -- Option B: improve ESGF architecture to remove requirement for duplication …

    + preserves clean IPR management of ESGF;
    - unfunded development work required;

First steps for enabling cooperation:

- Agree C3S and IS-ENES-C4I are complementary
- Setup communication



Possibilities for cooperation:

- Connect to CDS from C4I:
  - Valuable asset for impact researchers
  - Use in C4I toolset (calculations, visualizations)
- Provide expertise on data, processing,
  - WPS, ESMValtool, ...
  - Cooperation on user engagement and requirements
  - Use C3S experience and network
- Link to each others portals
- ....

Questions & Comments