IS-ENES3 1st General Assembly
25-27th March 2020
Toulouse, France

Status of ESGF for CMIP6

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

Overview

1. CMIP6 in ESGF
   a. Overview: Data Nodes → Models
   b. Some statistics
2. IS-ENES3 ESGF related services supporting CMIP6
   a. User support
   b. data citation and PIDs
   c. Errata
   d. Synda and replication
   e. ESMvaltool data products (prototype)
   f. (standards and conventions: CF and DRequ)
   g. (es-doc → separate talk)
3. CMIP6 via ESGF to processing
   a. CMIP6 processing associated to data pools (ESGF and non ESGF)

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CMIP6 in ESGF:

Portals:

- 3 tier1 site portals: CEDA, DKRZ, IPSL
- 1 tier2 site portal: LIU/SMHI

Data Nodes: 11 (from 29 worldwide) and **associated institutes** (inst_id)

- Sweden: LIU (inst_id: EC_EARTH)
- Spain: BSC (inst_id: EC_EARTH)
- Norway: (inst_id: NCC)
- France: CNRM (inst_id: CNRM-CERFACS), IPSL (Inst_id: IPSL)
- Ireland: ICHEC (inst_id: EC-Earth-Consortium)
- Italy: CINECA (inst_id: EC_EARTH), CMCC (inst_id: CMCC)
- England: CEDA (Inst_id: CMCC, CNRM-CERFACS, EC-EARTH, ECMWF, MOHC, MPI-M, NERC, NIMS-KMA, NIWA)
- Germany: DWD, DKRZ (Inst_id: AER, AWI, DKRZ, DWD, Hammoz-Consortium, INM, MOHC, MPI-M, RTE-RRTMGP-Consortium, UHH)
- (Denmark: CORDEX only)

Models: 86 worldwide, EU: 40 (3 INM)   (source_id: model identifier)

CMIP6 in ESGF: Europe / world

- Number of datasets (worldwide): 2.921.511 (+ 76.431 retracted)
  - Replica: 2.611.182
- Number of datasets (Europe): 1.340.942 (+ 33.215 retracted)
  - Replica: 483.430
- Number of files (worldwide): 10.882.989
  - Replica: 6.531.058
- Number of files (Europe): 6.905.026
  - Replica: 1.326.377
- Size (worldwide): 5.54 PB (+ 3.75 PB published Replica)
- Size (Europe): 3.88 PB (+ 1.3 PB published Replica)

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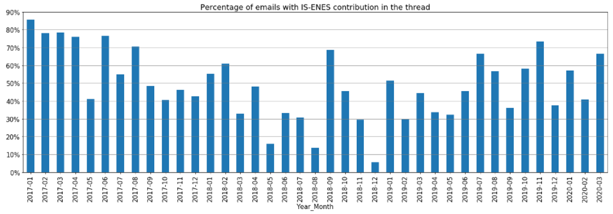
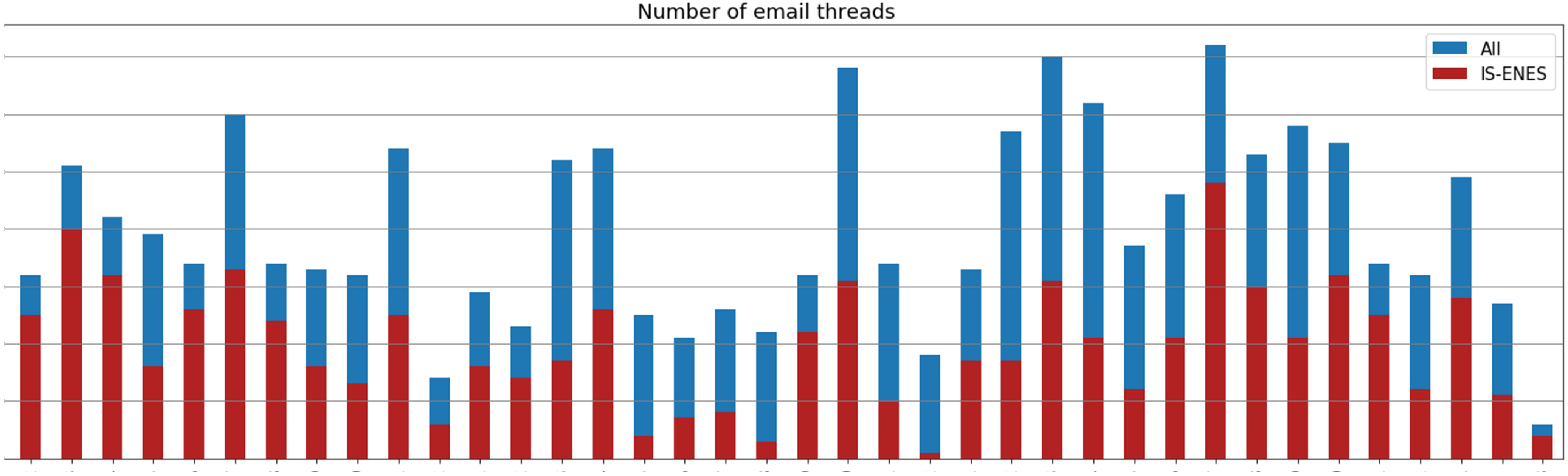
IS-ENES3 services CMIP6/ESGF: User support

- ESGF user enquiries on ESGF user email list → (distributed) ENES support staff
- No dedicated support system(s) → support forum, ticketing system etc. :-(
- Open access policy reduced end-user download problems significantly ..





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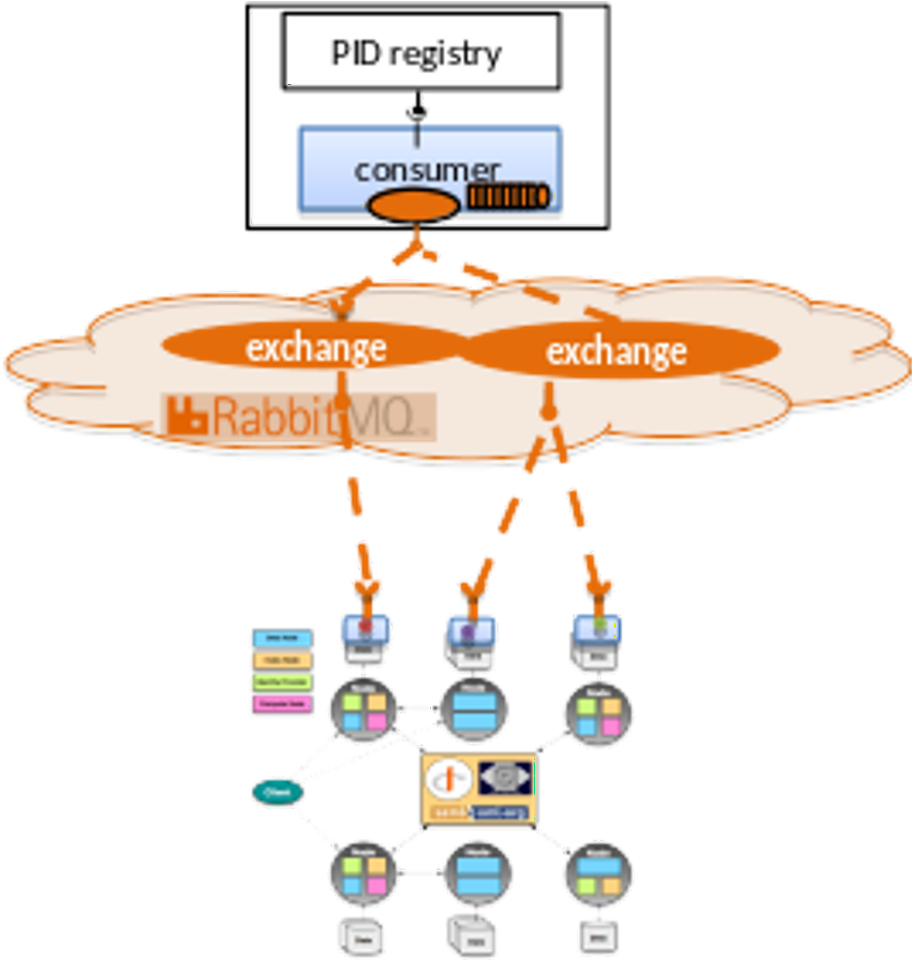
IS-ENES3 services CMIP6/ESGF: Persistent identifiers



- Successful operation of ESGF/distributed message queue/ Handle infrastructure at global scale
  - Central ~40 GB central registry DB (handle system based) and consumer components
  - Distributed message queue nodes at IPSL, LLNL, DKRZ, GFDL
  - operational agreements as part of CDNOT and WCRP WIP
- Status CMIP6
  - ~ 11 * 10^6 file PIDs + 1.4 * 10^6 dataset PIDs registered
  - overall 16.5 * 10^6 PIDs assigned (including retracted etc.)
  - << 0.1% registration problems (e.g. firewall issues), automatic curation scripts in place
- Cooperation with other e-infra efforts: EOSC-hub, EPIC, EUDAT, ...

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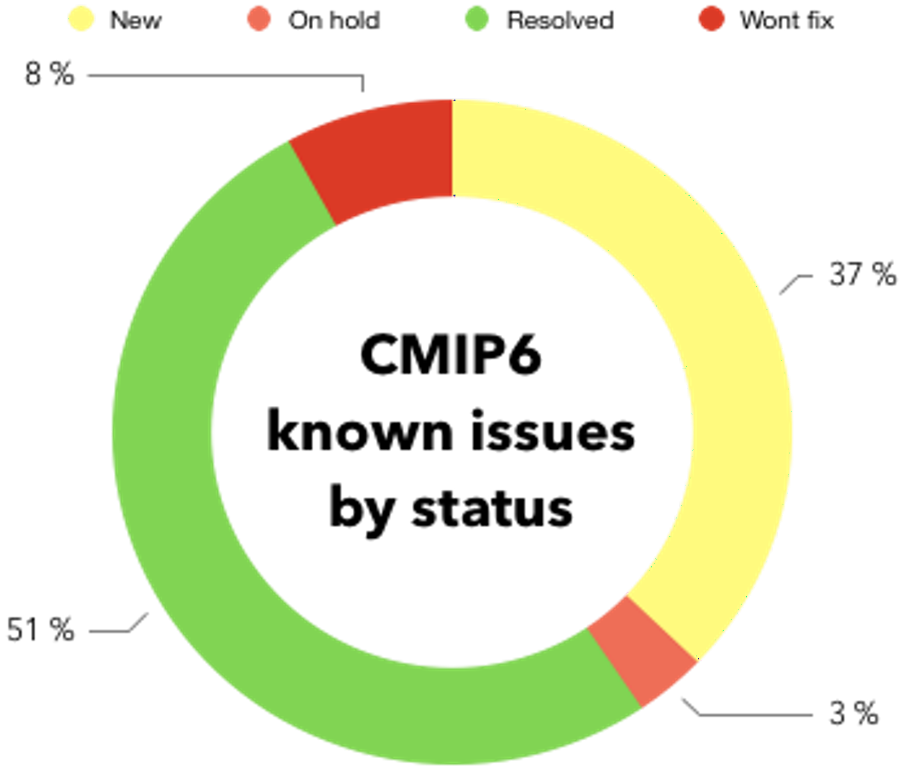
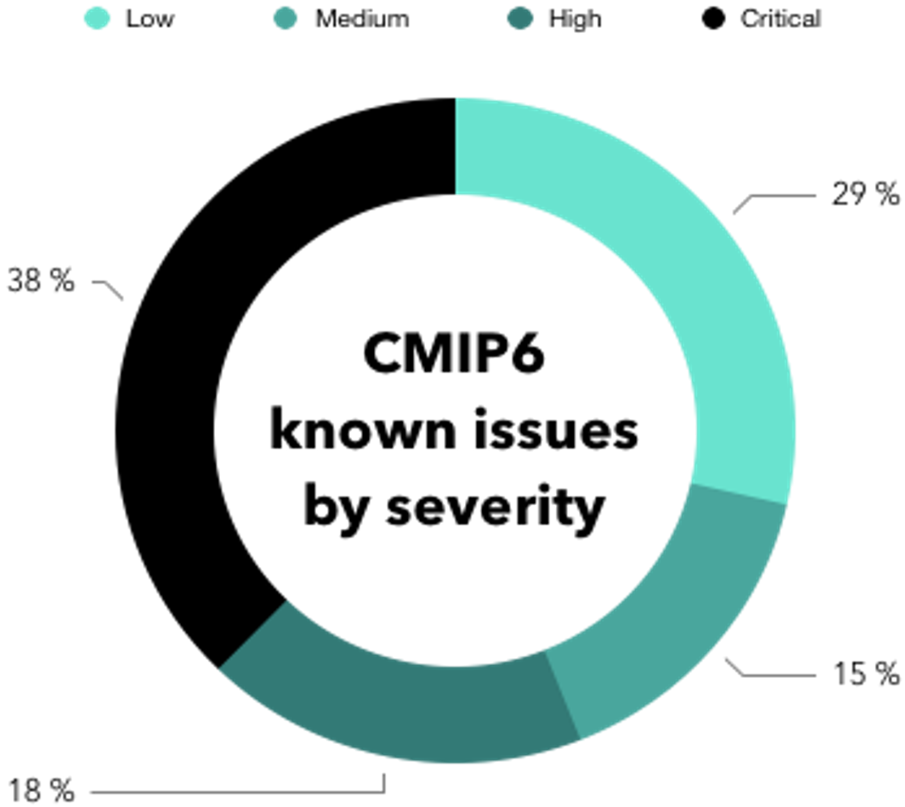
IS-ENES3 services CMIP6/ESGF: Errata

- **175 issues** currently registered on the service
- 89,993 datasets affected by at least one issue or **3% of the CMIP6 archive**.





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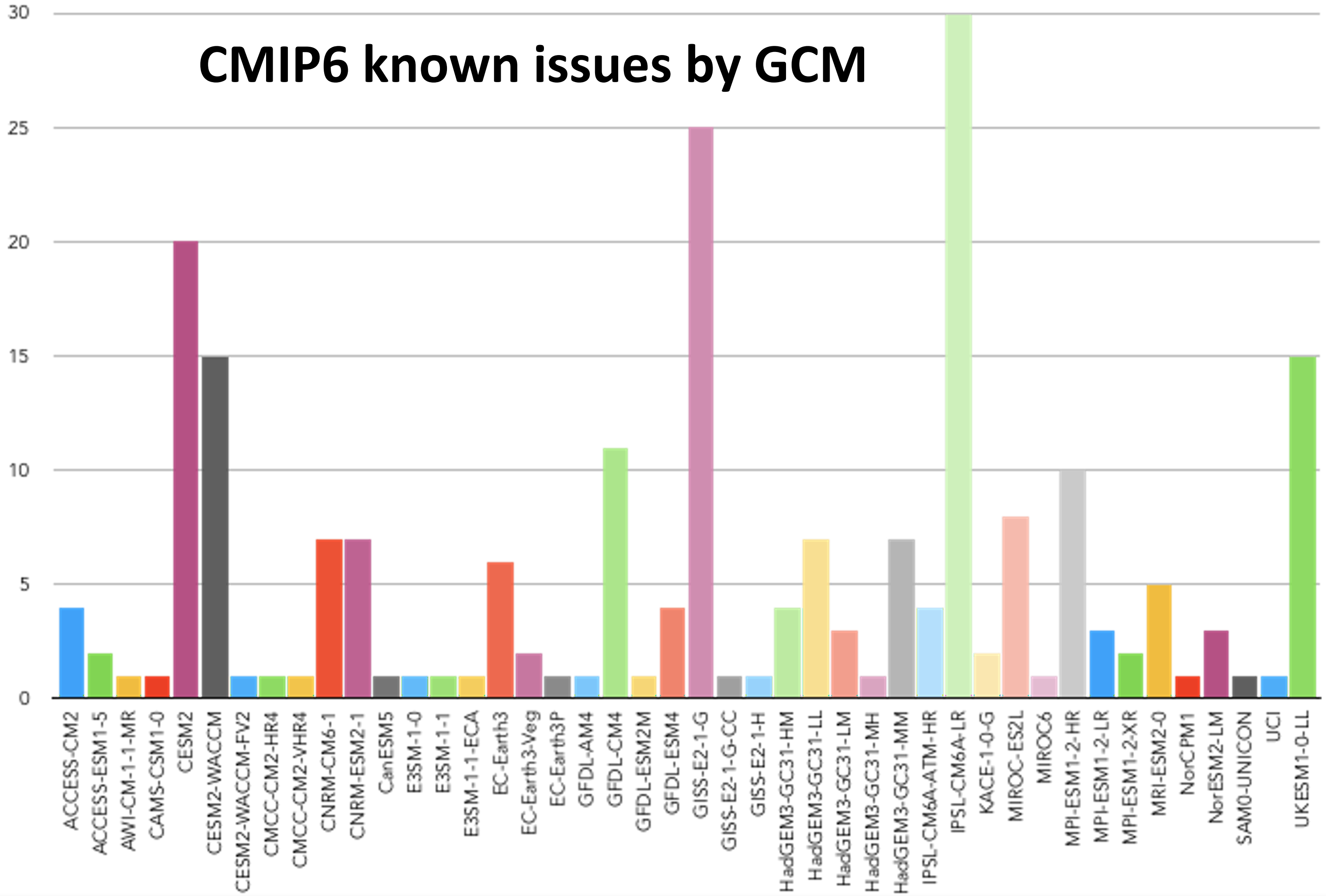
IS-ENES3 services CMIP6/ESGF: Errata

Statistics to be considered **carefully**:

- Some modelling groups do still **NOT** follow CDNOT recommendations and publication workflow
- Most of CMIP6 production has **NOT** yet been analyzed



CMIP6 known issues by GCM

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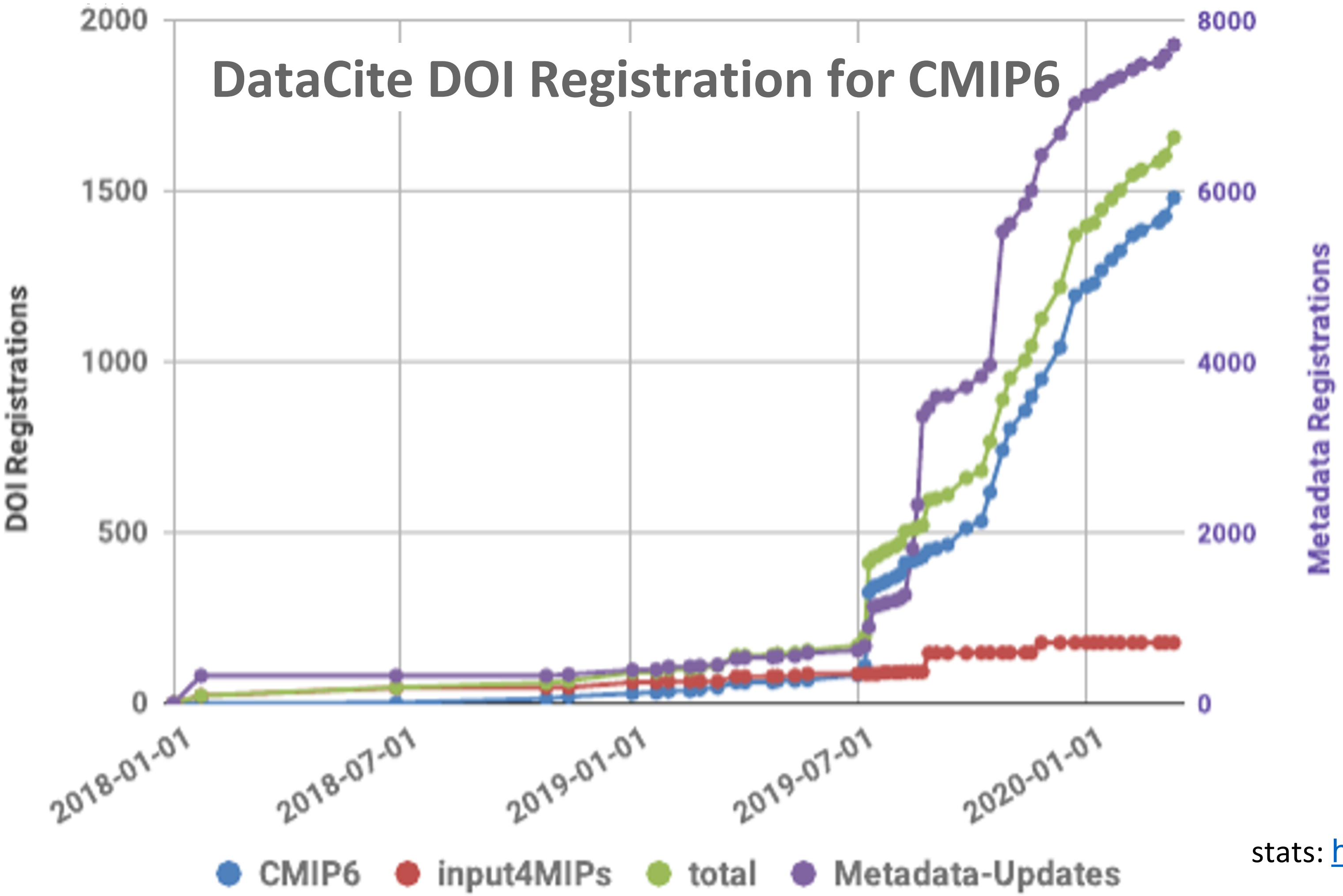
IS-ENES3 services CMIP6/ESGF: Data citation



stats: http://bit.ly/CMIP6_DOI_Statistics

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IS-ENES3 services CMIP6/ESGF: synda

- The “Transfer module” (aka “sdt”) is being refactored and migrated to Python 3.7
  - GitHub repo : https://github.com/Prodiguer/synda
    - Issues: 50 open vs. 67 closed
    - Pull requests : 0 open vs. 16 closed
  - 4 branches:
    - `master`: Last functional release with Conda installation and test suite
    - `synda-python3`: incoming Python 3 release with full refactoring
    - `gh-pages`: host documentation
    - `get-file-caching`: additional feature used by PCMDI
  - Releases to date: 33
  - Release scheme: conda package
  - Major points (challenges) ahead:
    - Revise integration with Globus after Lukasz latest coding sprint
    - ORM `sqlalchemy` could facilitate changing db technology (opens door for optimize access to db).
- The “Post-processing module” (aka “sdp”) is dropping to consider integration with other proven pipeline orchestration tool as “Cylc”.

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IS-ENES3 services CMIP6/ESGF: Data Pools

- Replication is based on synda tool and coordinated as part of CDNOT
- DKRZ: ~ 5 PByte disk pool, currently filled with ~2.5 PByte CMIPt data (1 PByte original and 1.5 PByte replica which are only partially republished)
  transfer to archive (CERA, WDC climate) will start in summer
- IPSL: ~ 2PByte CMIP6 disk pool, currently filled with 812.8 TByte, replica partially republished
- CEDA: ~ 2 PByte CMIP6 disk pool, ~ 1 PByte replica
- CMCC: on demand replication from DKRZ

- No access statistics as the data is freely accessible for researchers with accounts at DKRZ, IPSL and CEDA (→ problem for VA/TNA accounting ..)
- Very positive feedback from users (yet service availability not broadly known ..)
- Data pools are basis for TNA and VA compute services
  (different environments, different data cataloguing at centers ..)

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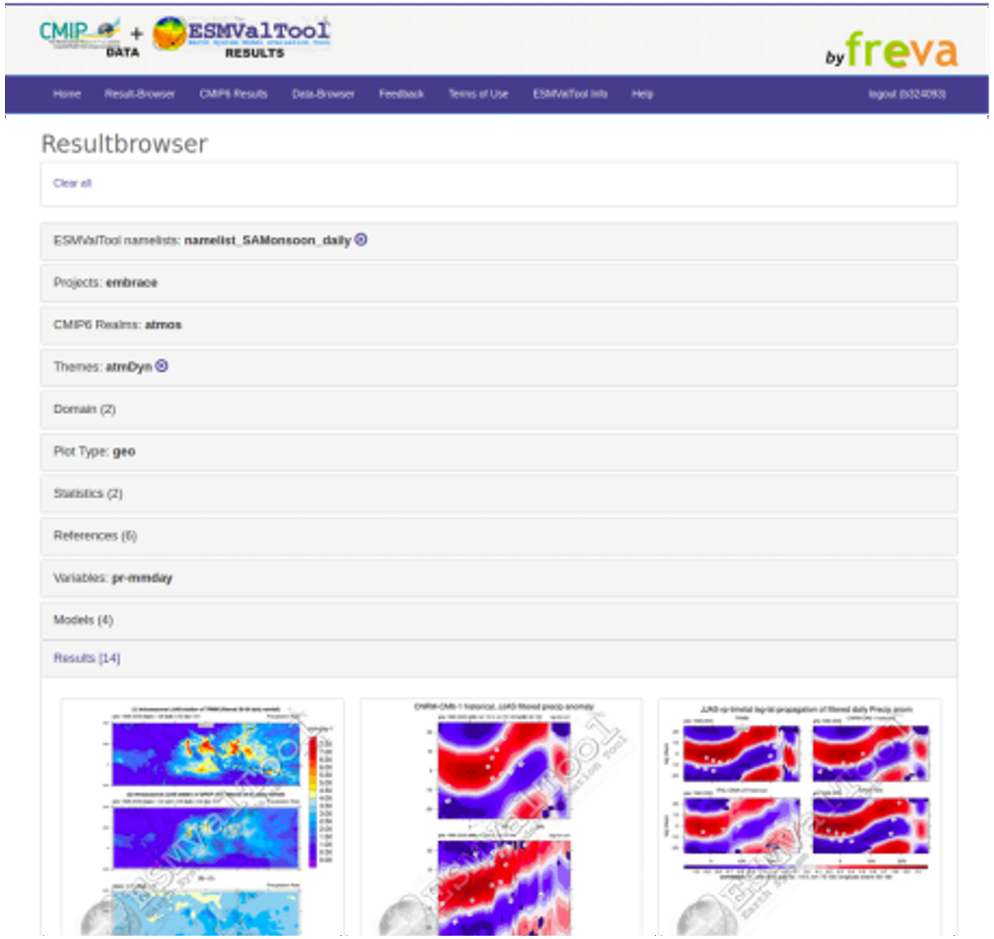
CMIP6 via ESGF to processing: ESMValtool data products

pre-operational service running at DKRZ: https://cmip-esmvaltool.dkrz.de


CMIP DATA + ESMValTool RESULTS
by freva
Home
Result-Browser
CMIP6 Results
Data-Browser
Feedback
Terms of Use
ESMValTool Info
Help
logout (b324093)
CNRM-CM6-1 historical, JJAS filtered precip anomaly
JJAS-rp-lineal lag/lat propagation of filtered daily Precip anom

Resultbrowser

Clear all

ESMValTool namelists: **namelist_SAMonsoon_daily** ⊗

Projects: **embrace**

CMIP6 Realms: **atmos**

Themes: **atmDyn** ⊗

Domain (2)

Plot Type: **geo**

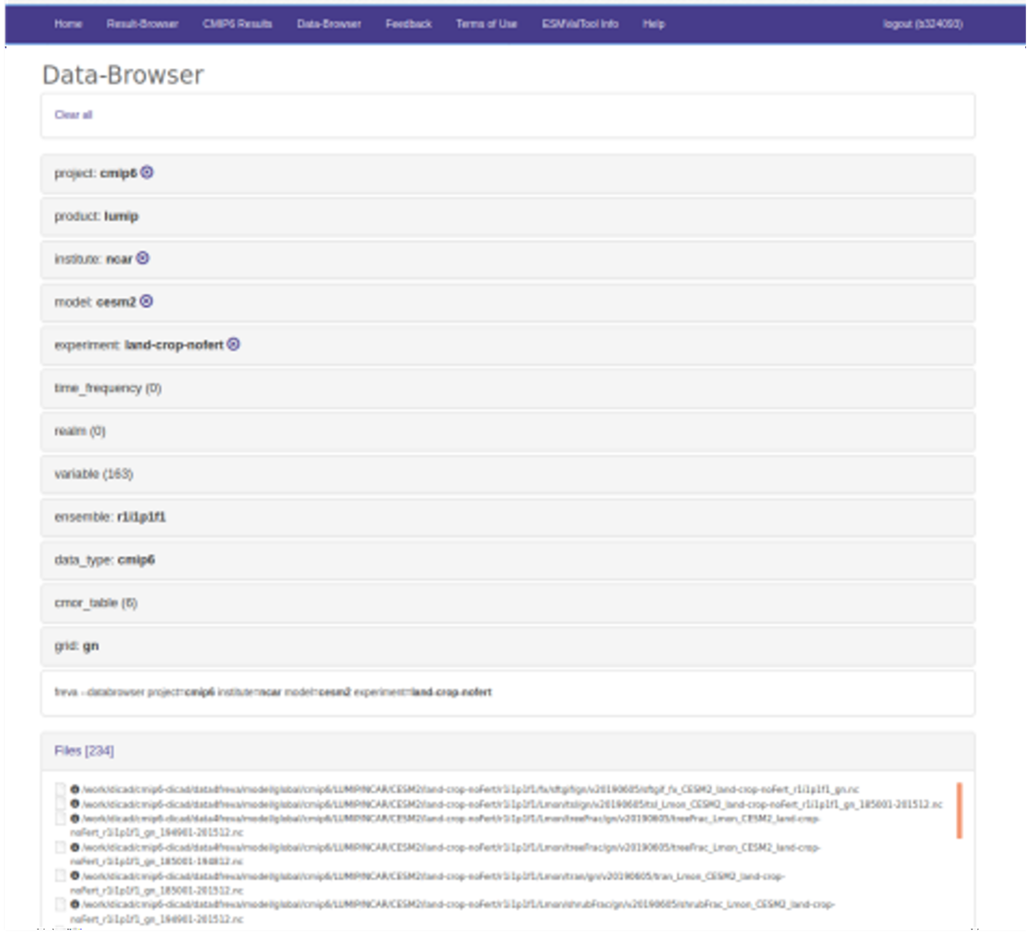
Statistics (2)

References (6)

Variables: **pr-mmday**

Models (4)

Results [14]



Data-Browser

Clear all

project: **cmip6** ⊗

product: **lumip**

institute: **ncar** ⊗

model: **cesm2** ⊗

experiment: **land-crop-nofert** ⊗

time_frequency (0)

realm (0)

variable (163)

ensemble: **r1i1p1f1**

data_type: **cmip6**

cmor_table (6)

grid: **gn**

```
freva --databrowser project=cmip6 institute=ncar model=cesm2 experiment=land-crop-nofert
```

Files [234]

```
/work/dicad/cmip6-dicad/data4freva/model/global/cmip6/LUMIP/NCAR/CESM2/land-crop-noFert/r1i1p1f1/fx/sftgif/gn/v20190605/sftgif_fx_CESM2_land-crop-noFert_r1i1p1f1_gn.nc
/work/dicad/cmip6-dicad/data4freva/model/global/cmip6/LUMIP/NCAR/CESM2/land-crop-noFert/r1i1p1f1/Lmon/tsl/gn/v20190605/tsl_Lmon_CESM2_land-crop-noFert_r1i1p1f1_gn_185001-201512.nc
/work/dicad/cmip6-dicad/data4freva/model/global/cmip6/LUMIP/NCAR/CESM2/land-crop-noFert/r1i1p1f1/Lmon/treeFrac/gn/v20190605/treeFrac_Lmon_CESM2_land-crop-noFert_r1i1p1f1_gn_194901-201512.nc
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/work/dicad/cmip6-dicad/data4freva/model/global/cmip6/LUMIP/NCAR/CESM2/land-crop-noFert/r1i1p1f1/Lmon/tran/gn/v20190605/tran_Lmon_CESM2_land-crop-noFert_r1i1p1f1_gn_185001-201512.nc
/work/dicad/cmip6-dicad/data4freva/model/global/cmip6/LUMIP/NCAR/CESM2/land-crop-noFert/r1i1p1f1/Lmon/shrubFrac/gn/v20190605/shrubFrac_Lmon_CESM2_land-crop-noFert_r1i1p1f1_gn_194901-201512.nc
```

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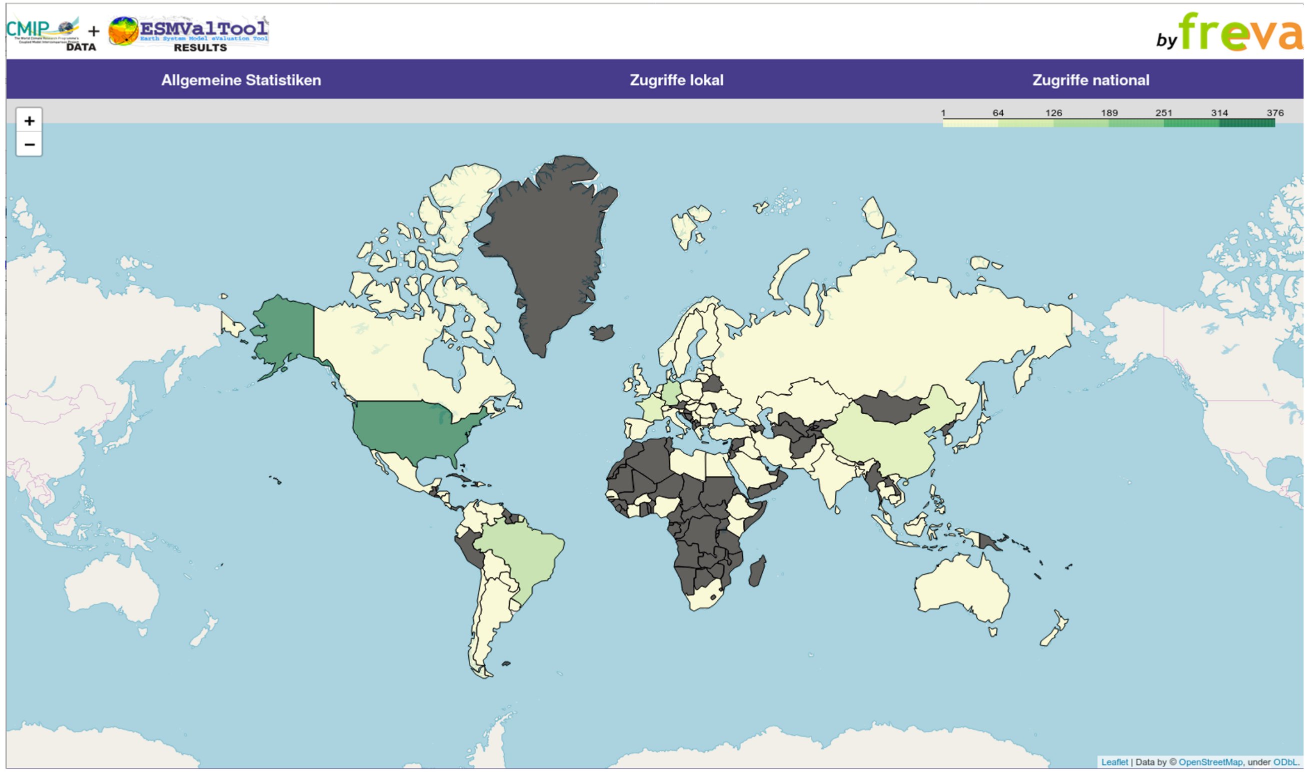
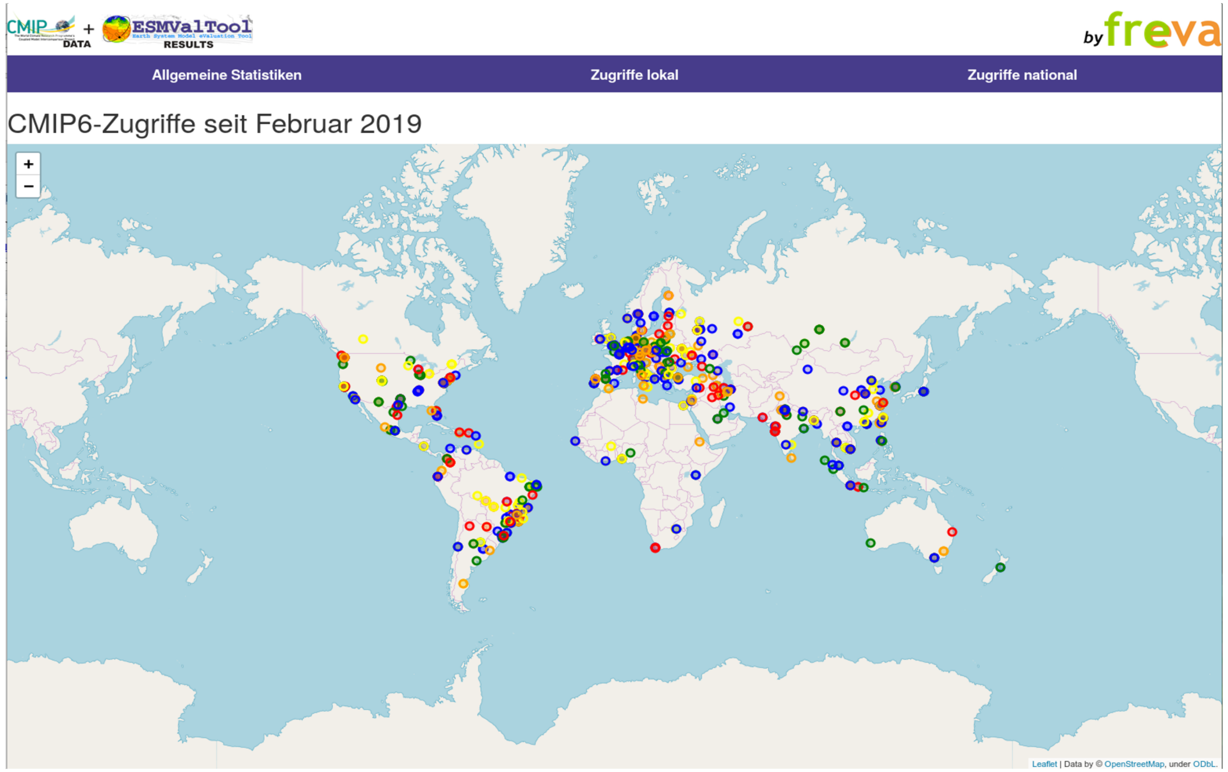
CMIP6 via ESGF to processing: ESMValtool data products

Access from countries (grey: no access)



Access since Feb. 2019



CMIP6-Zugriffe seit Februar 2019

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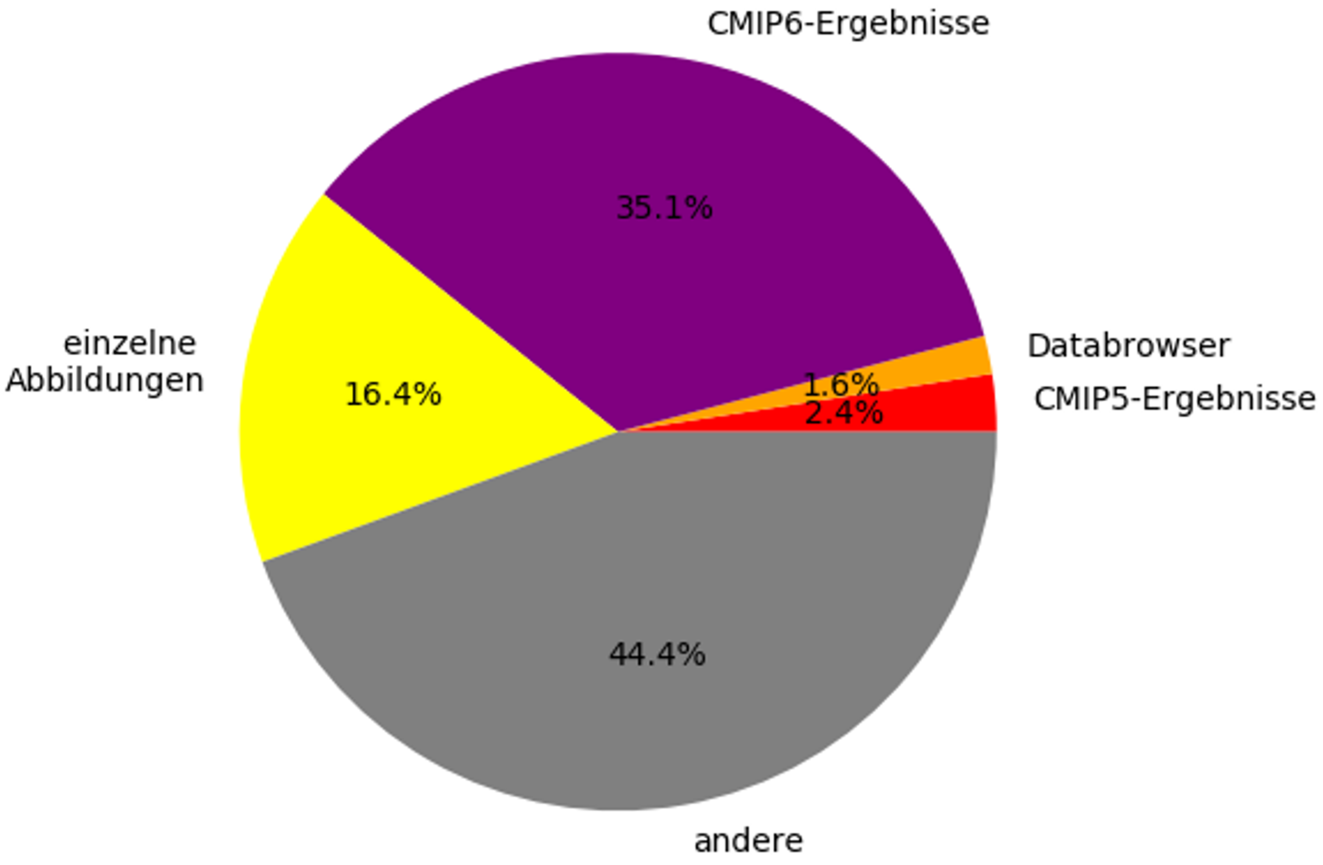
CMIP6 via ESGF to processing: ESMValtool data products

Status:

- operational prototype service
- by now no fully operational monitoring, will start in second half of 2020
- proven interest from research community, yet additional effort needed to operationalize
  - update frequency
  - metadata annotation / result search
  - integration roadmap with C4I open



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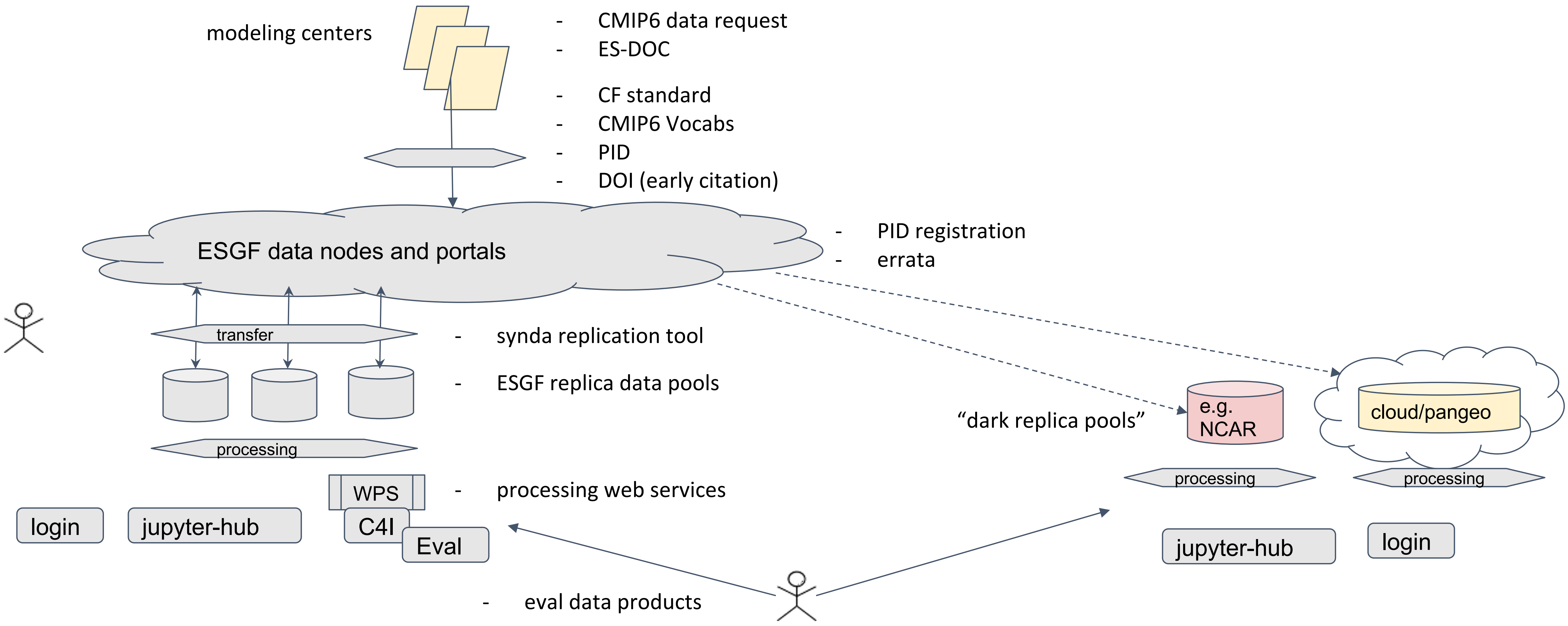
CMIP6 via ESGF to processing



modeling centers

- CMIP6 data request
- ES-DOC

- CF standard
- CMIP6 Vocabs
- PID
- DOI (early citation)

ESGF data nodes and portals

- PID registration
- errata

transfer

- synda replication tool

- ESGF replica data pools

processing

WPS

- processing web services

login

jupyter-hub

C4I

Eval

- eval data products

“dark replica pools”

e.g. NCAR

cloud/pangeo

processing

processing

jupyter-hub

login

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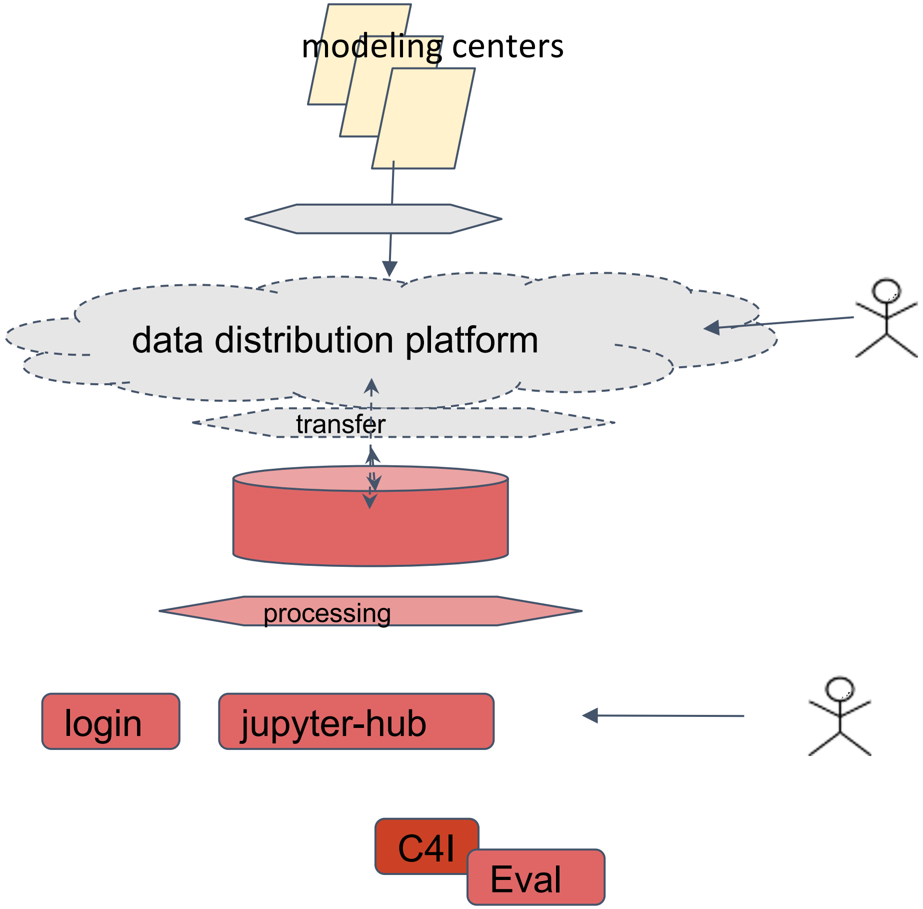
CMIP6 via ESGF to processing



Centrally managed data pools decouple usage scenarios from "core ESGF data distribution infrastructure":

- direct and jupyterhub based file access
- access to processing ressources

→ Changing requirements for "CORE ESGF" infrastructure and services

Key ENES CDI services quite independent of "CORE ESGF":

- Standards, Vocabs
- PID service, citation service → versioning info, citation info
- errata service
- es-doc service

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Thank you

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CMIP6 via ESGF to processing: Viewpoints

- end user view
  - (ESGF) search, (ESGF) download, process
- data pool view on CMIP6
  - search, locate, process
- downstream view: e.g. Evaluation portal, C4I

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

The Consortium

Coordinated by **CNRS-IPSL**, the IS-ENES3 project gathers **22 partners** in **11 countries**

with

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