



Earth Server-2

First experiences of using **WC(P)S** at ECMWF

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European Centre for Medium-Range Weather Forecasts

Workshop on Meteorological Operational Systems | #OpenDataWeek

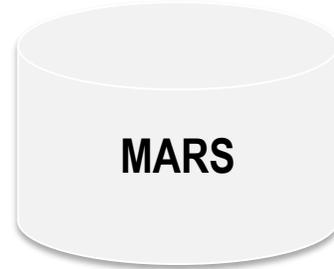
Reading, 2 March 2017





ECMWF's current data service

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retrieve,  
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type=an,  
stream=oper,  
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levtype=sfc,  
param=167.128,  
date=20150101/to/20150131,  
area=90/-180/-90/179.5,  
resol=AV,  
grid=0.5/0.5,  
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step=00,  
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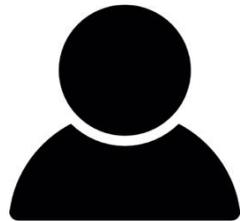


MARS



MARS
request

- Global data / subsets
- GRIB / netCDF

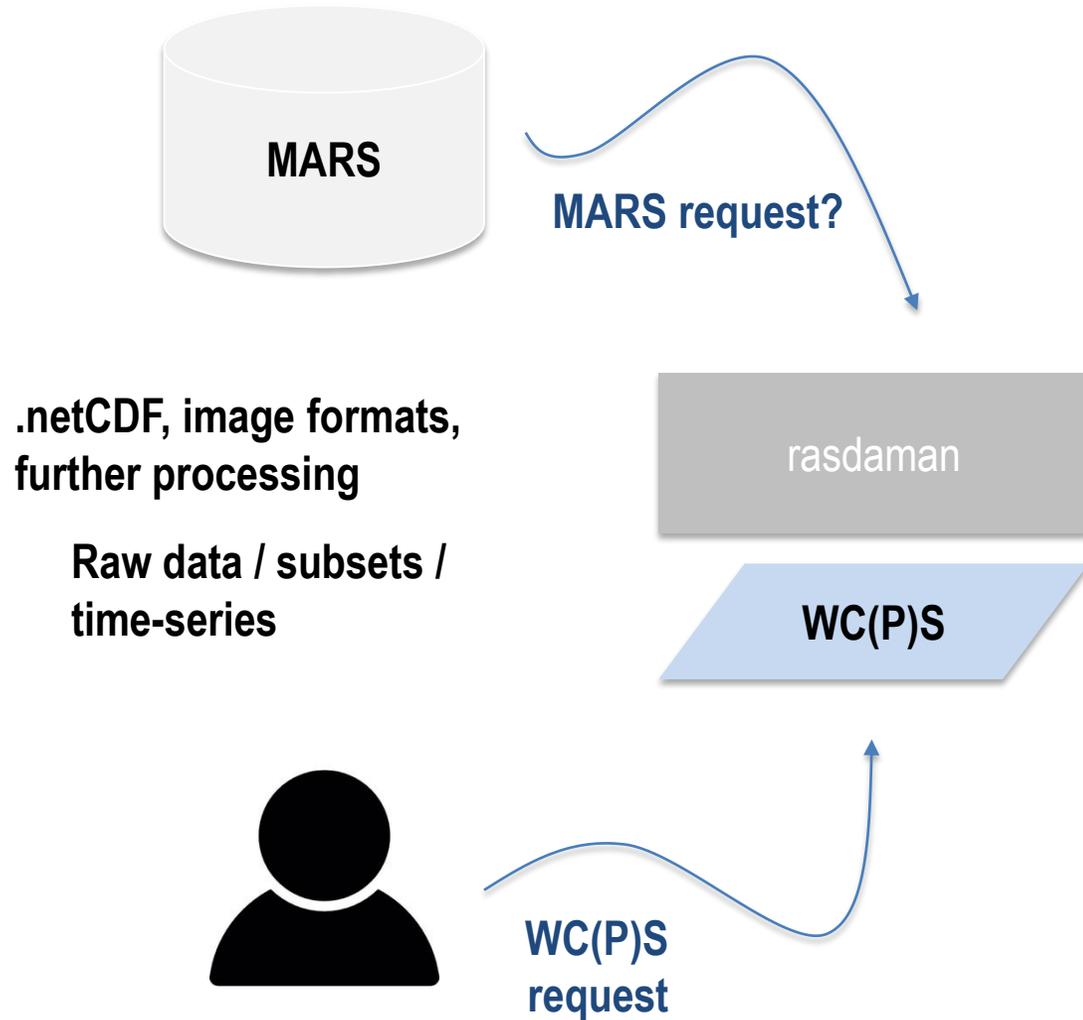


Limitations

- GRIB format
- Download Service
- Inefficient for time-series retrieval



ECMWF's participation in EarthServer-2

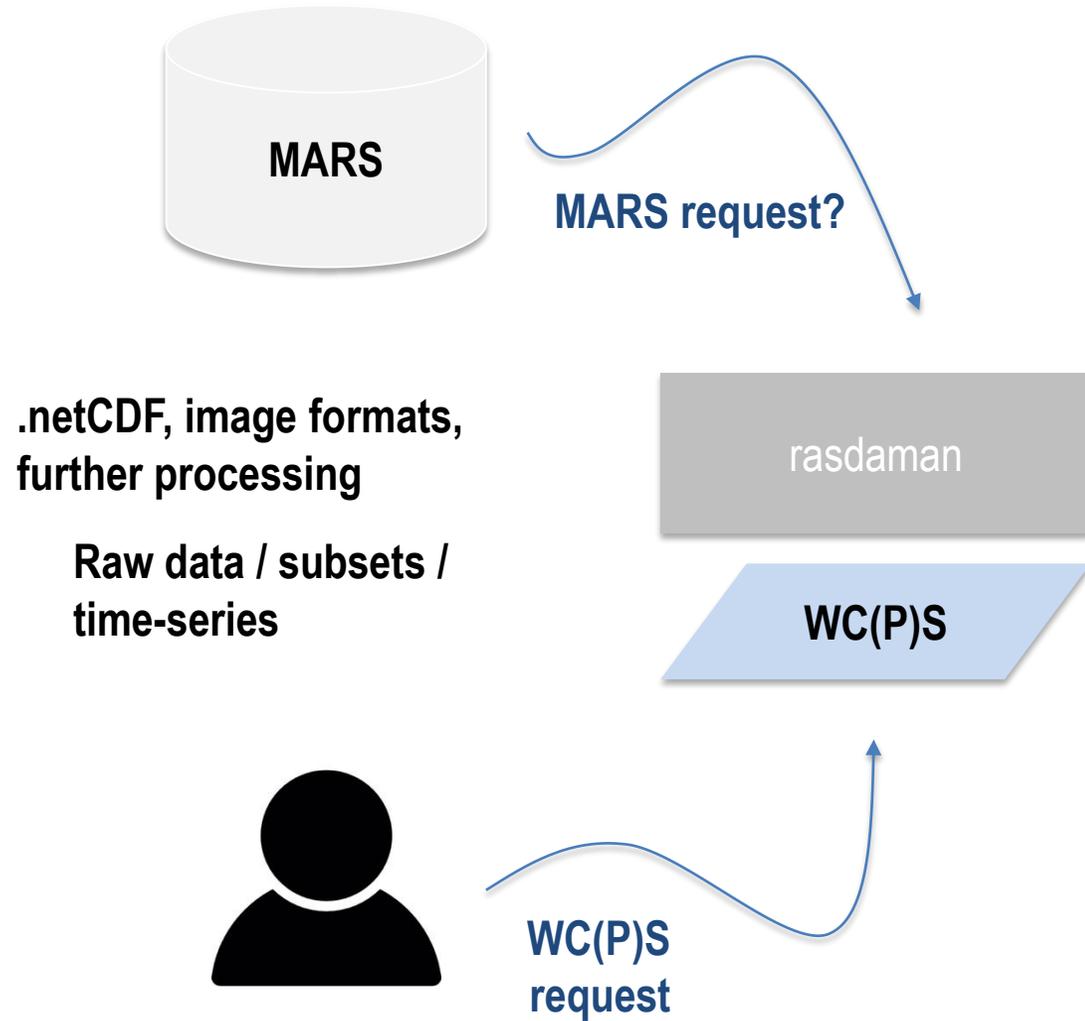


Objective

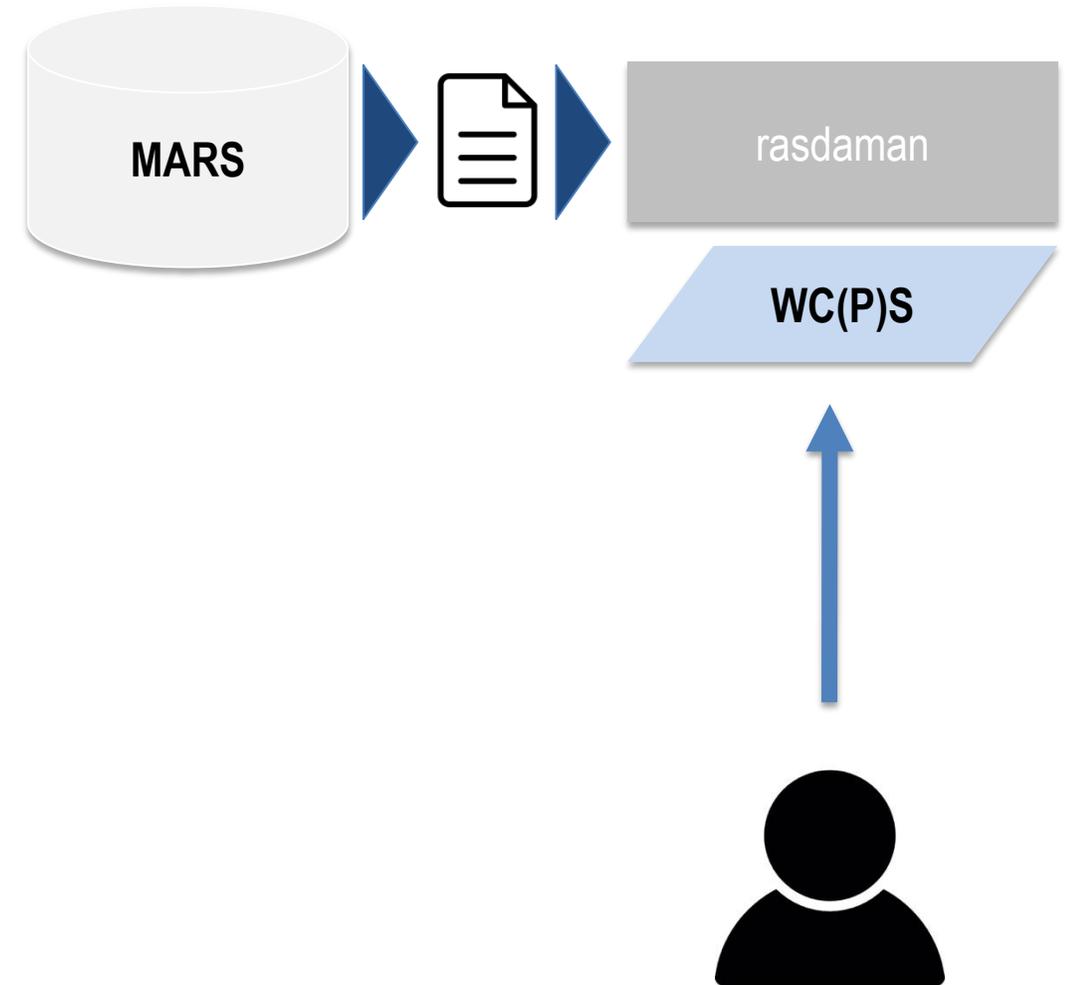
- Provide access to over 1 PB of global climate reanalysis data
- Offer server-based data access and processing
- Make ECMWF data more accessible to users, especially outside the MetOcean domain



ECMWF's participation in EarthServer-2



AIM



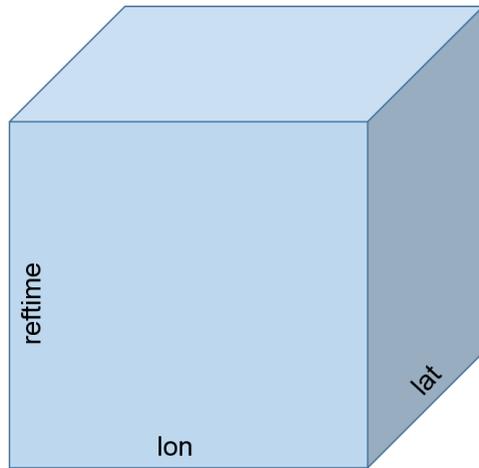
CURRENT STATUS



What has been done so far?

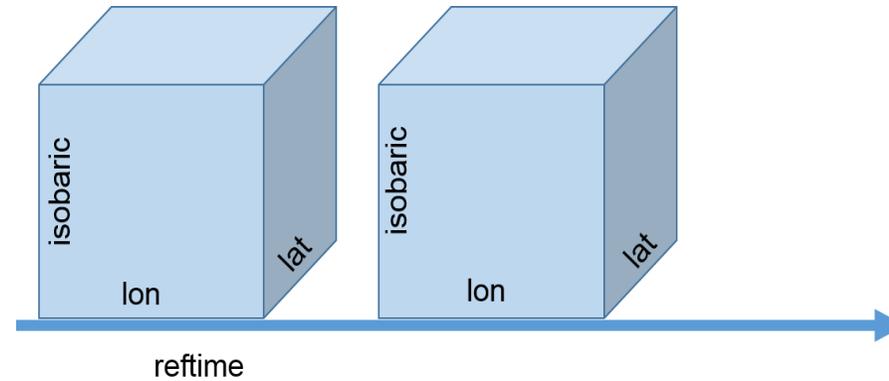
Identification of meteorological data models

3D



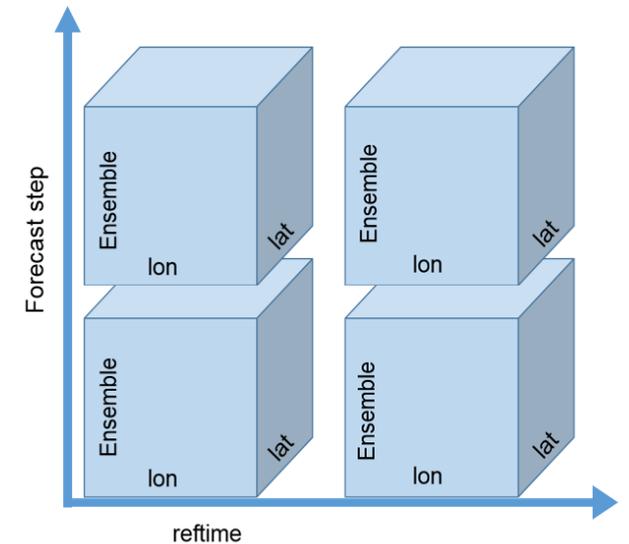
ERA-interim 2m air temperature (surface)

4D



ERA-interim temperature (pressure level)

5D



River discharge forecast (GLOFAS)



What has been done so far?

Setup of a WCS 2.0 with processing extension + demo web client

<http://earthserver.ecmwf.int/rasdaman/ows?service=WCS&version=2.0.1&request=GetCapabilities>



This XML file does not appear to have any style information associated with it. The document tree is shown below.

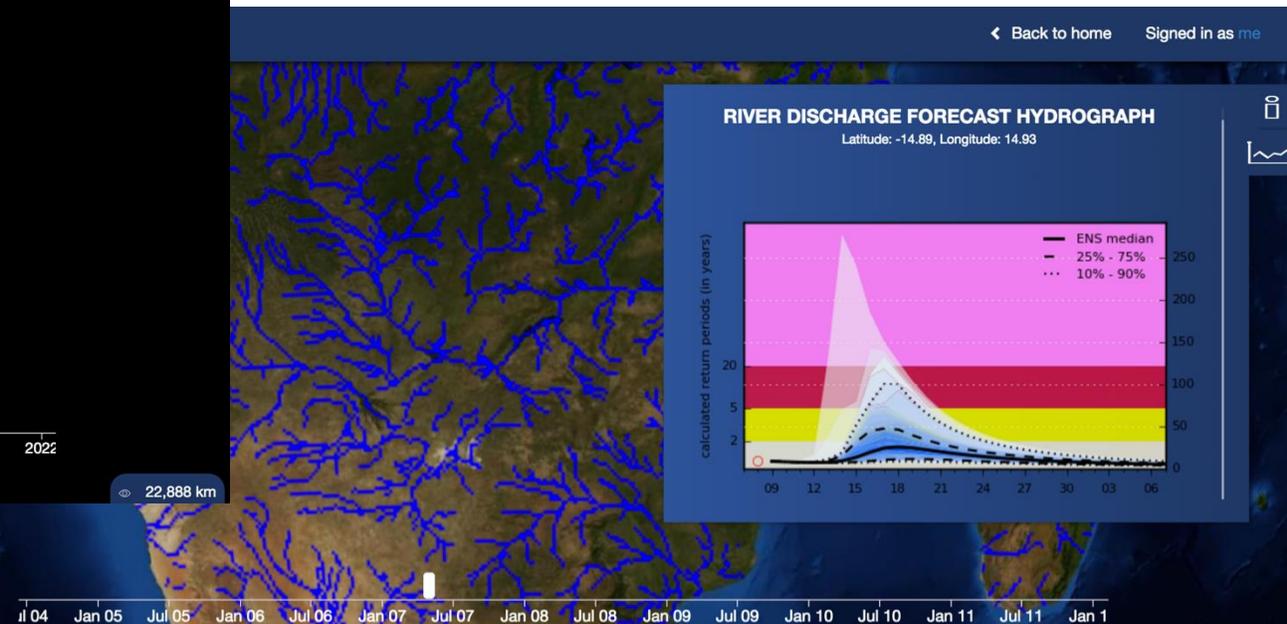
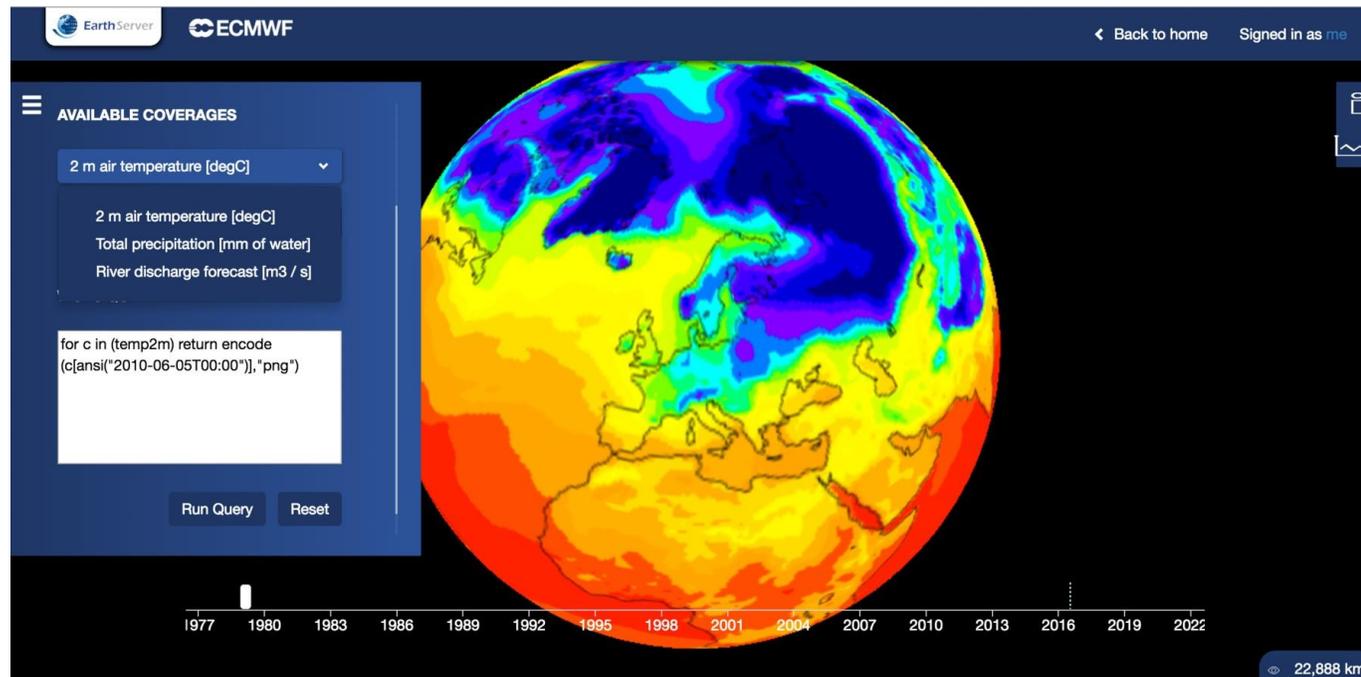
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xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://www.opengis.net/wcs/2.0 http://schemas.opengis.net/wcs/2.0/wcsAll.xsd" version="2.0.1">
  <ows:ServiceIdentification xmlns="http://www.opengis.net/ows/2.0">
    <ows:Title>
      Demonstration of a OGC Web Coverage Service (WCS) Server for Cimate Science Data | ECMWF
    </ows:Title>
    <ows:Abstract>
      This OGC WCS Server is set up in the framework of the H2020 project EarthServer-2. The server provides web-based access to 3D- and 4D climate reanalysis
      data. The aim is to provide access to more than 1 Petabytes (PB) of global reanalysis data retrieved from ECMWFs MARS archive.
    </ows:Abstract>
    <ows:ServiceType>OGC WCS</ows:ServiceType>
    <ows:ServiceTypeVersion>2.0.1</ows:ServiceTypeVersion>
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      http://www.opengis.net/spec/GMLCOV/1.0/conf/gml-coverage
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    </ows:Profile>
    ...
  </ows:ServiceIdentification>
  ...
</wcs:Capabilities>
```



What has been done so far?

Setup of a WCS 2.0 with processing extension + demo web client

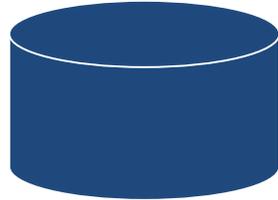
<http://earthserver.ecmwf.int/earthserver/worldwind/>





What has been done so far?

Extensive performance testing of server technology



DATA INGEST v. REGISTRATION

- Structure of grib files (e.g. monthly vs yearly files)
- Multi-dimensional GRIB / netCDF support



DATA REQUEST

- Data model in returned netCDF
- Performance of different requests (point retrieval vs. geographical subsetting)



What has been done so far?

Liaison with potential web service users

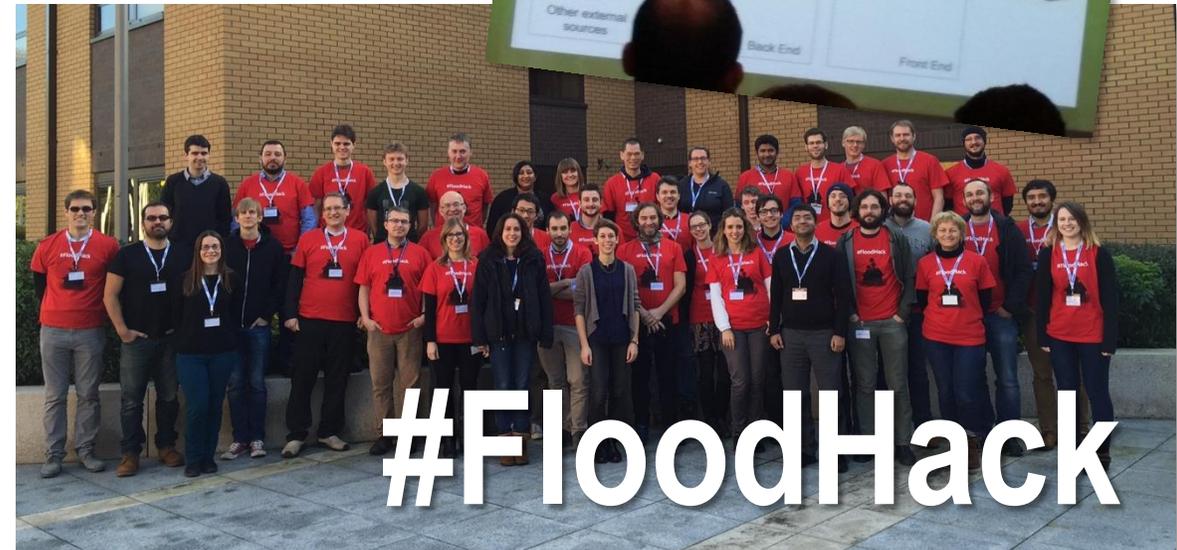
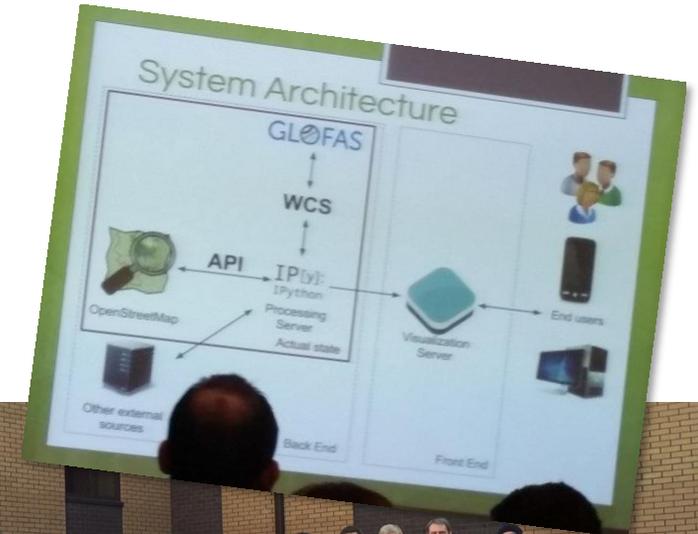
Tutorials

OGC WCS

https://nbviewer.jupyter.org/github/earthserver-eu/OGC_WCS_tutorial/blob/master/index.ipynb

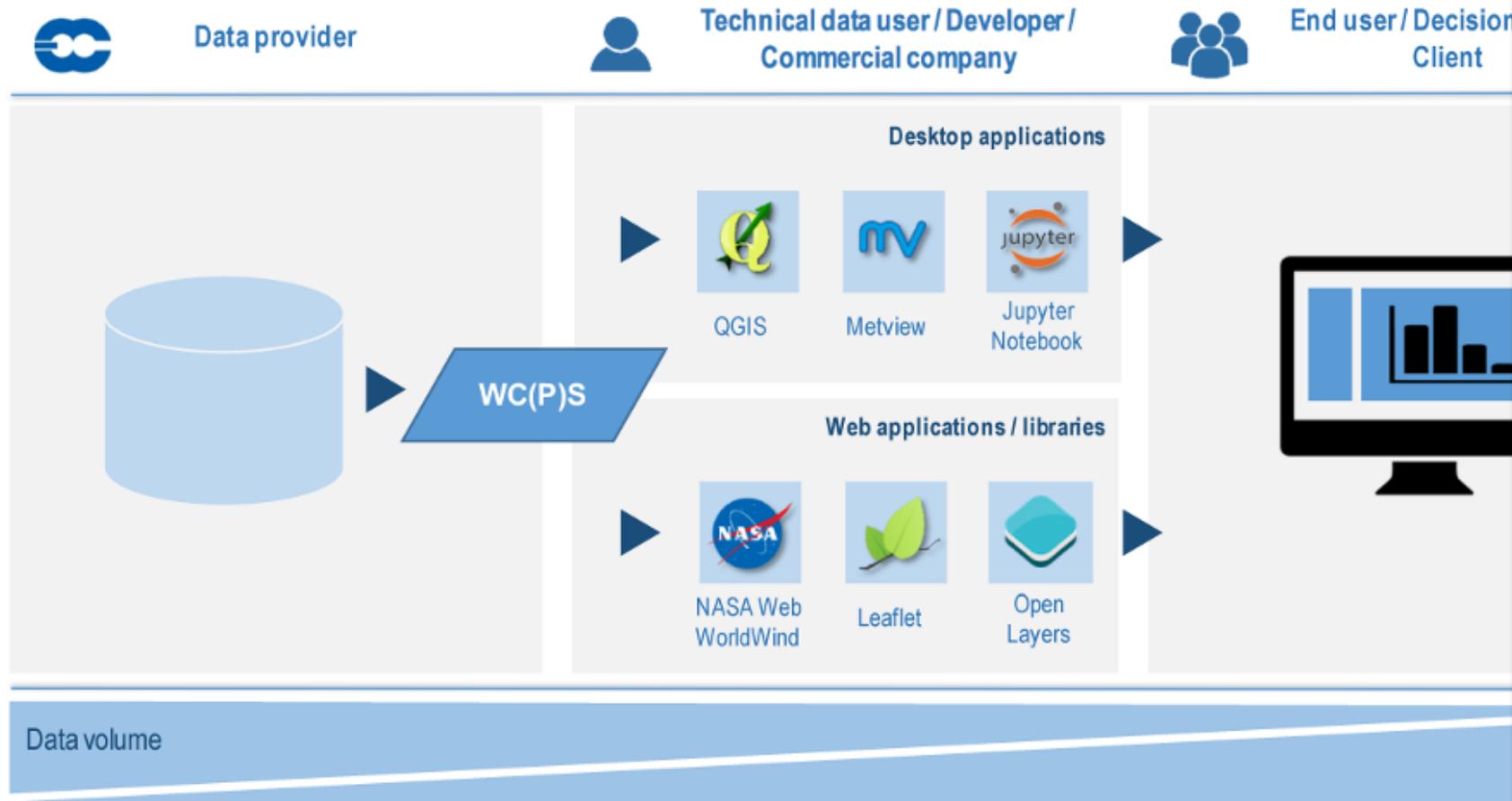
Use-cases

<https://nbviewer.jupyter.org/github/earthserver-eu/geospatial-workflow-with-wcps/blob/master/index.ipynb>





Preliminary conclusion



- WCS is **way – forward** for large data centers
- As an **ancillary data service** → not a replacement of existing data services



BUT...

MetOcean



e.g. Geospatial



Challenges on different levels

**Semantic
data model**

**User
requirements**

**Server
performance**



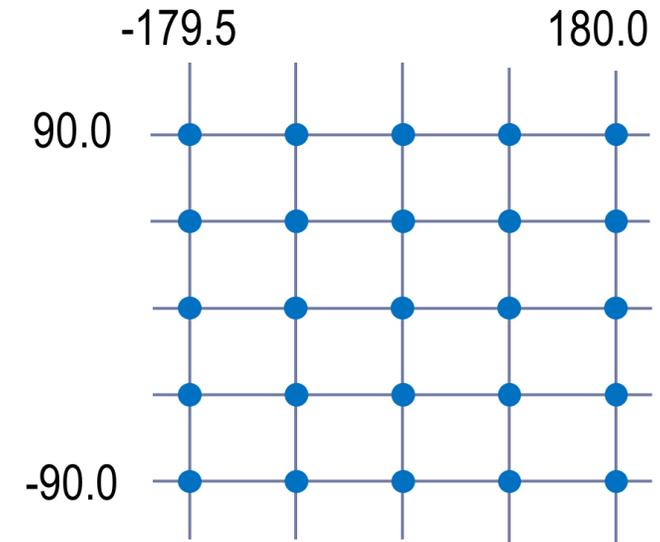
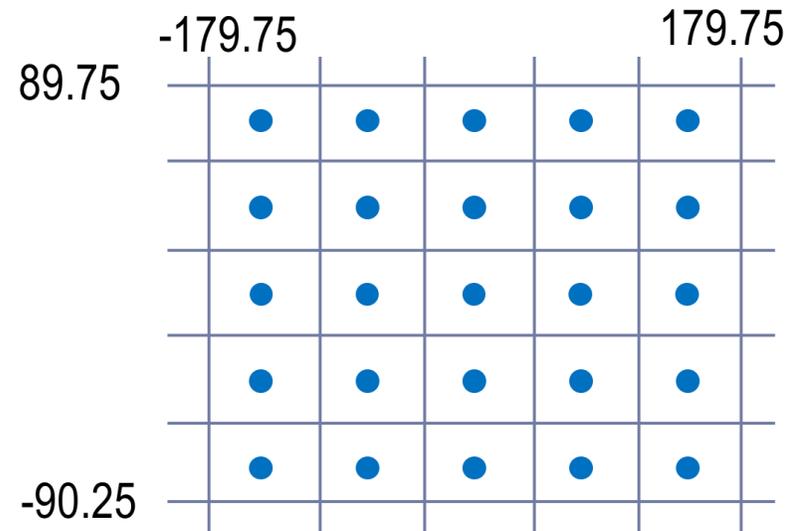
Challenges on different levels

Semantic
data model

User
requirements

Server
performance

Pixel vs. Grid-point





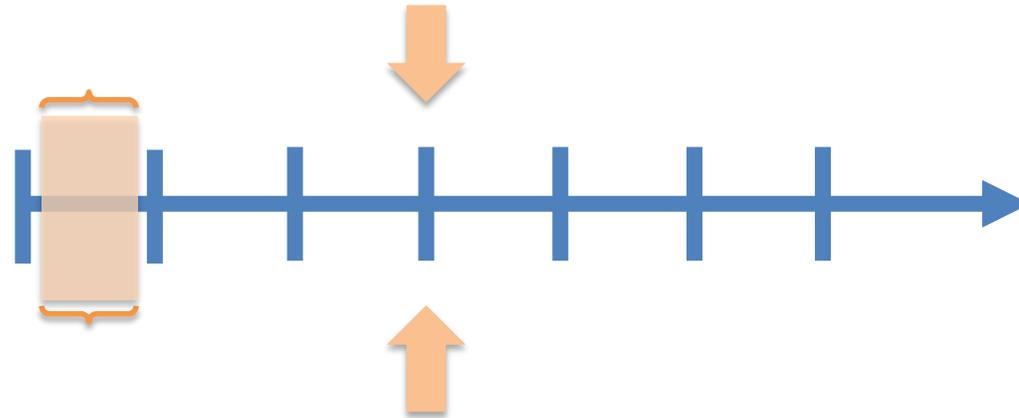
Challenges on different levels

Semantic
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User
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Server
performance

Continuous vs. discrete space





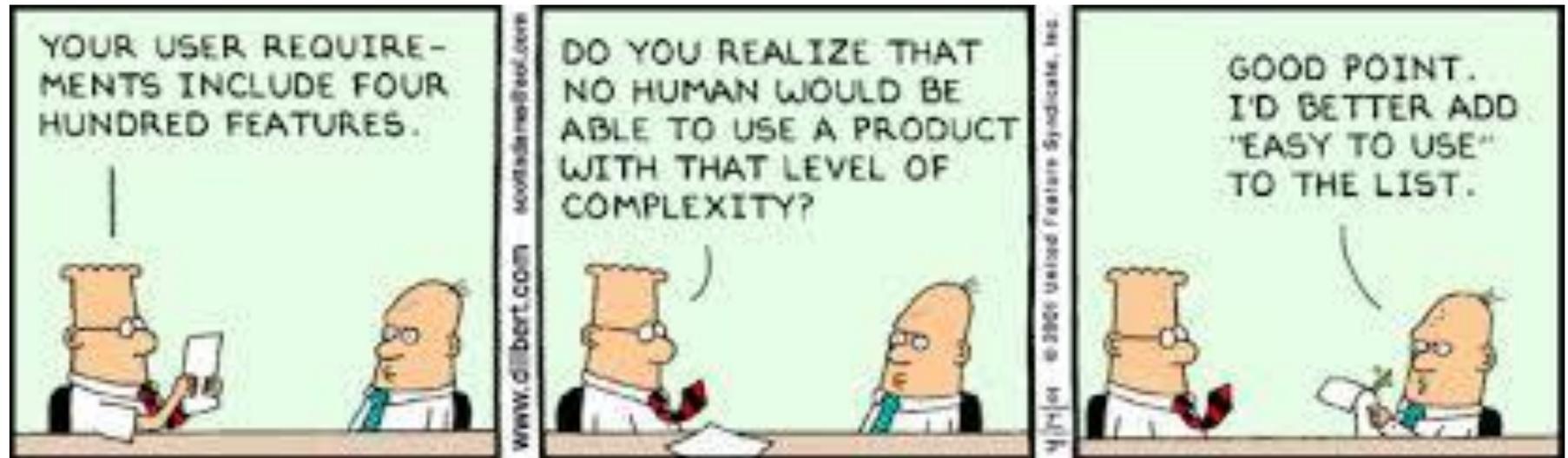
Challenges on different levels

Semantic
data model

User
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Server
performance

Keep it simple and hide complexity





Challenges on different levels

Semantic
data model

User
requirements

Server
performance

Keep it simple and hide complexity

DATA FORMATS

- Formats such as GeoJSON

METADATA INFORMATION

- Example: lat/lon information for ad-hoc plotting

HUMAN vs. MACHINE READABLE

- Example: ansi date format vs. unix time



Challenges on different levels

Semantic
data model

User
requirements

Server
performance

rasdaman-MARS connection

ASYNCHRONOUS DATA ACCESS

SCALABILITY?

OPEN QUESTIONS

- Limit data volume per request?
- Flexibility for different kind of requests (point retrieval vs. geographical subset)
- How to store data in rasdaman?
- How to retrieve data from MARS?



Conclusion

- Quite far away from being an **“operational” service**
- Further **testing / exploration** required
- **Potential to offer on-demand data access** in an interoperable way
- **Stronger advocacy of MetOcean domain** in developing / defining standards

What's next?

- Focus on **rasdaman-MARS** connection
- Practical examples of **MetOcean Application Profile**

THANK YOU!

Questions?