



ECMWF strategic projects: an overview

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Bologna Data Centre



Bologna Our New Datacentre (BOND) in short

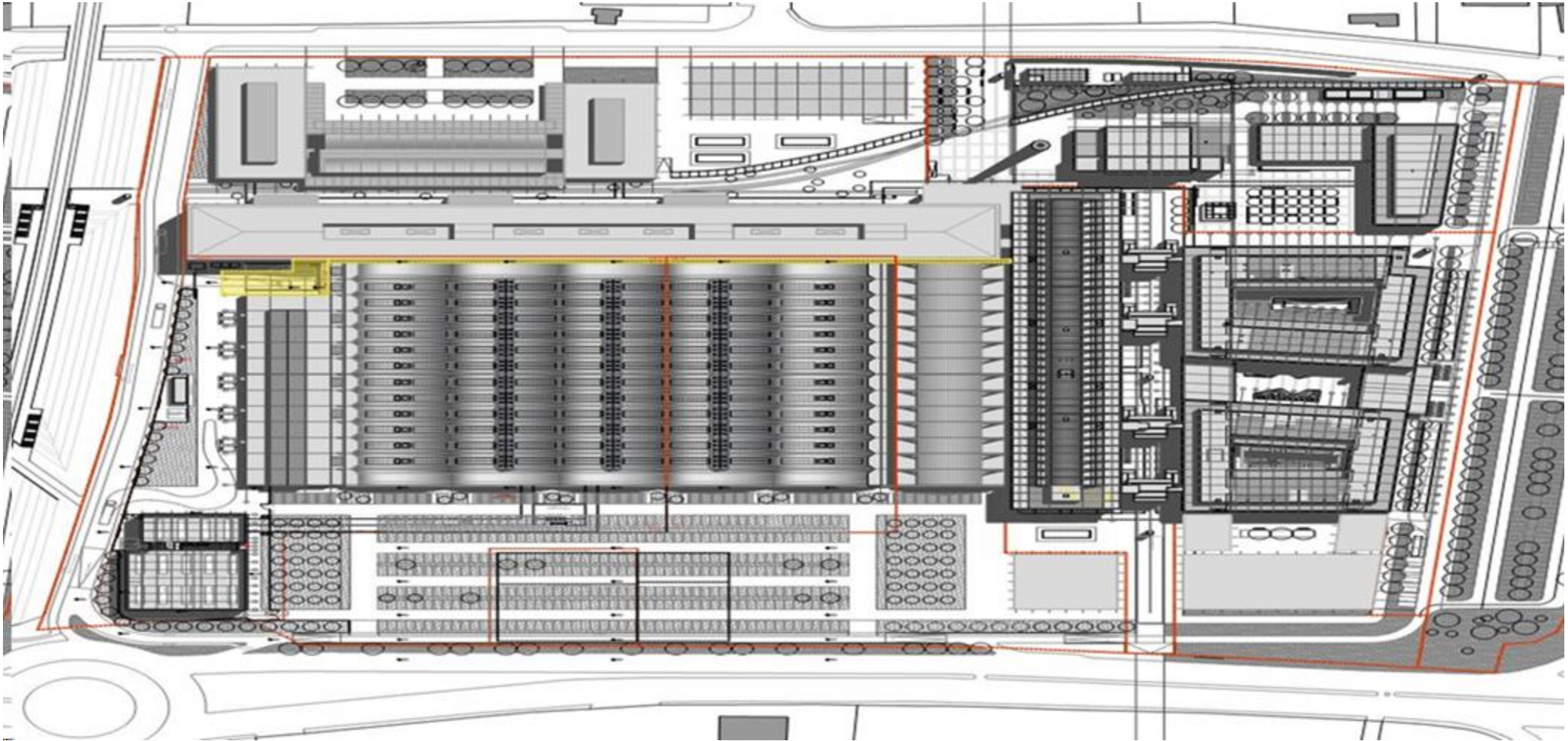
Why a new data centre?

A new fully operational, fully equipped datacentre in Bologna, operational end of 2020

- The current data centre facility does not offer the required flexibility for future growth and changes in high-performance computing (HPC) technology.
- The goals set out in ECMWF's ten-year Strategy launched in September 2016 include the development of a **5 km ensemble system by 2025**. Intermediary goals to 2020 already require that the Centre's next supercomputers should provide a significant increase in our computational capacity.
- The additional processors and power needed would require a significant expansion of our current data centre infrastructure, which unfortunately cannot be achieved in our current location.



Data design master plan



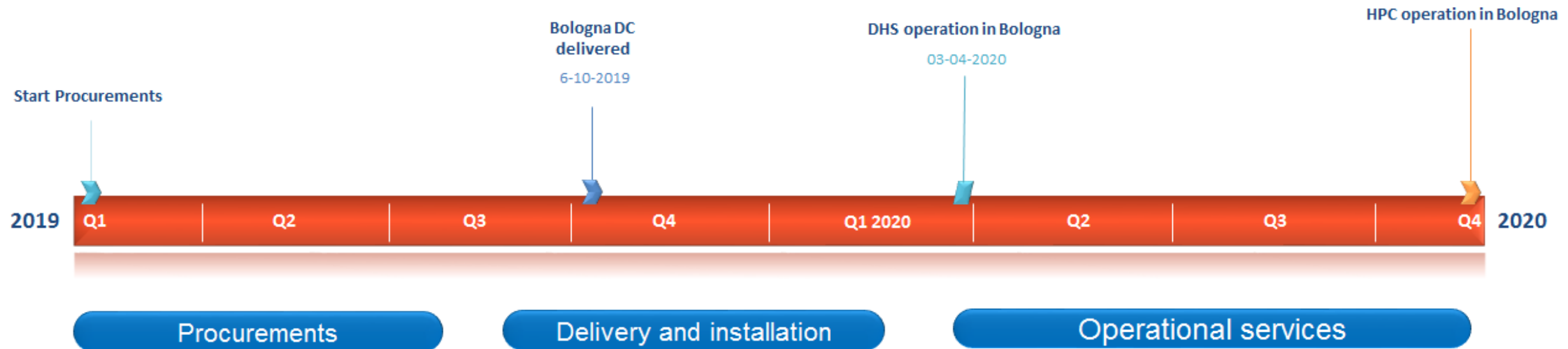
Current site May 2019



What it will look like



BOND Programme – Time line

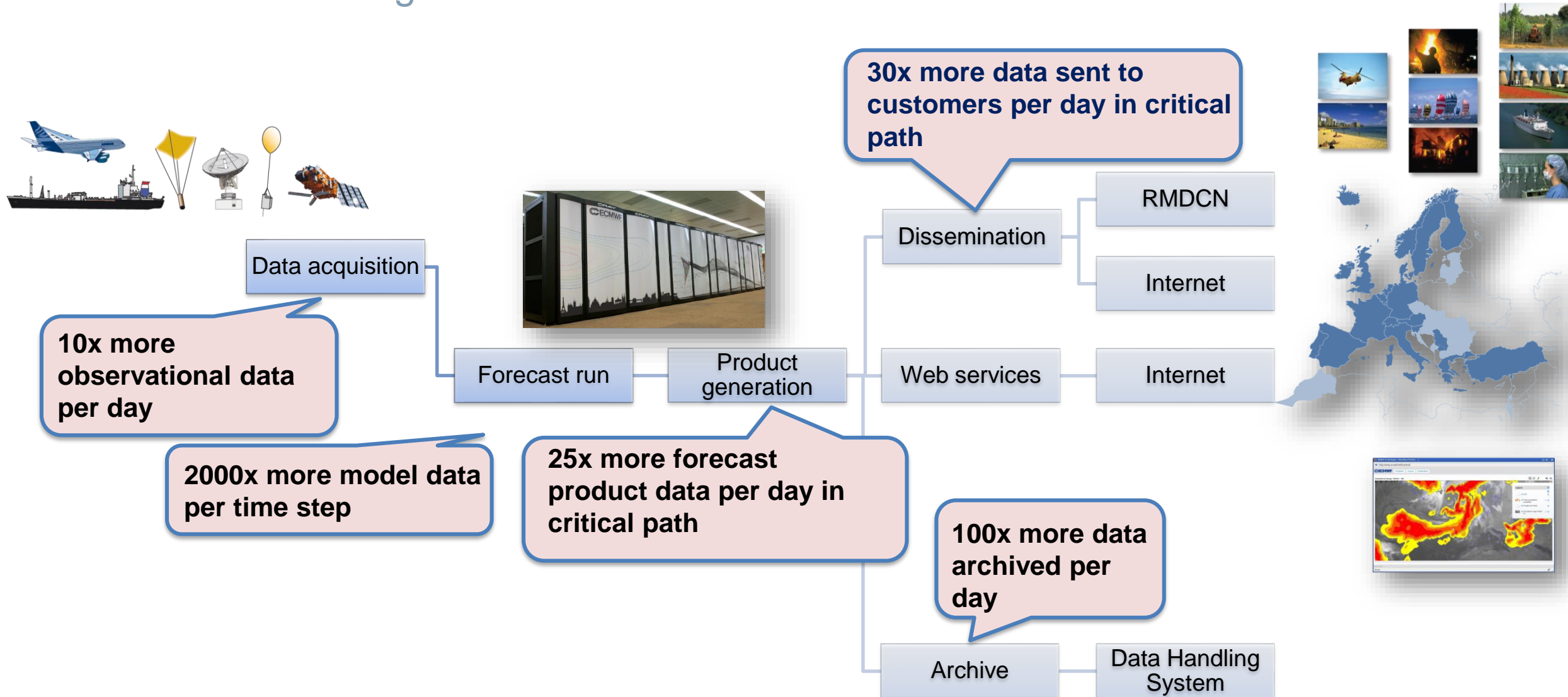




European weather Cloud



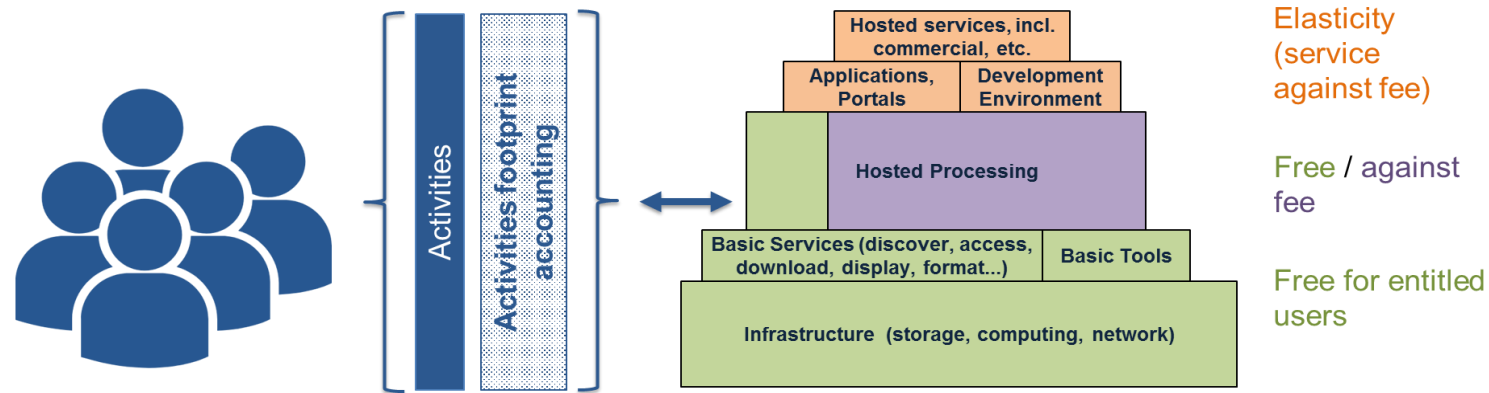
10-Year Challenge



The European Weather Cloud: services



- Two year pilot project started in January 2019 in collaboration between ECMWF and EUMETSAT
- Aiming at building a cloud computing infrastructure focussed on the needs of the European Meteorological Infrastructure (EMI)
- To experiment with providing services at different levels, from data access to hosted processing and hosted services



- basic services (data discovery, data access, display and reformat, download, registration to offered services, user helpdesk, etc.) supported by a set of tools
- hosted processing (catalogue of VMs for performing key tasks...)
- hosted applications, possibly supported by hosted portals and by development environments
- complete hosted services, including hosted commercial activities

The European Weather Cloud: use cases



Use cases collected so far by ECMWF and EUMETSAT to test the capabilities of the cloud include:

- OGC Web services (various data sources, including ECMWF)
- Data processing for a dispersion model (various data sources, including ECMWF)
- Distribution of the output of a Limited Area Model running at ECMWF
- Cloud cover forecast (ECMWF and EUMETSAT data)
- Visualisation of ocean surface winds ((ECMWF and EUMETSAT data)
- Distribution of surface observations in near-real time (EUMETNET/ECOMET data sources)
- Distributed model data processing and blending (various data sources, including ECMWF)
- Historical dataset machine learning model training (various data sources, including ECMWF)
- Limited forecast production in the event of total outage at an NMS's data centre (external data sources)

The European Weather Cloud: next steps



- **June 2019:** first tests on prototype pilot infrastructure at ECMWF
 - More hardware procured
 - Integration with internal Morpheus cloud management platform.
- **Summer/Autumn 2019:** development of policy for use of the cloud by NMSs of Member States. Study possible use by other users.
- **Mid-September 2019:** federated pilot infrastructure at EUMETSAT and ECMWF opens
 - Start working on use cases
- **Beginning January 2020:** process to add one or two additional members in the federated infrastructure



operational plans



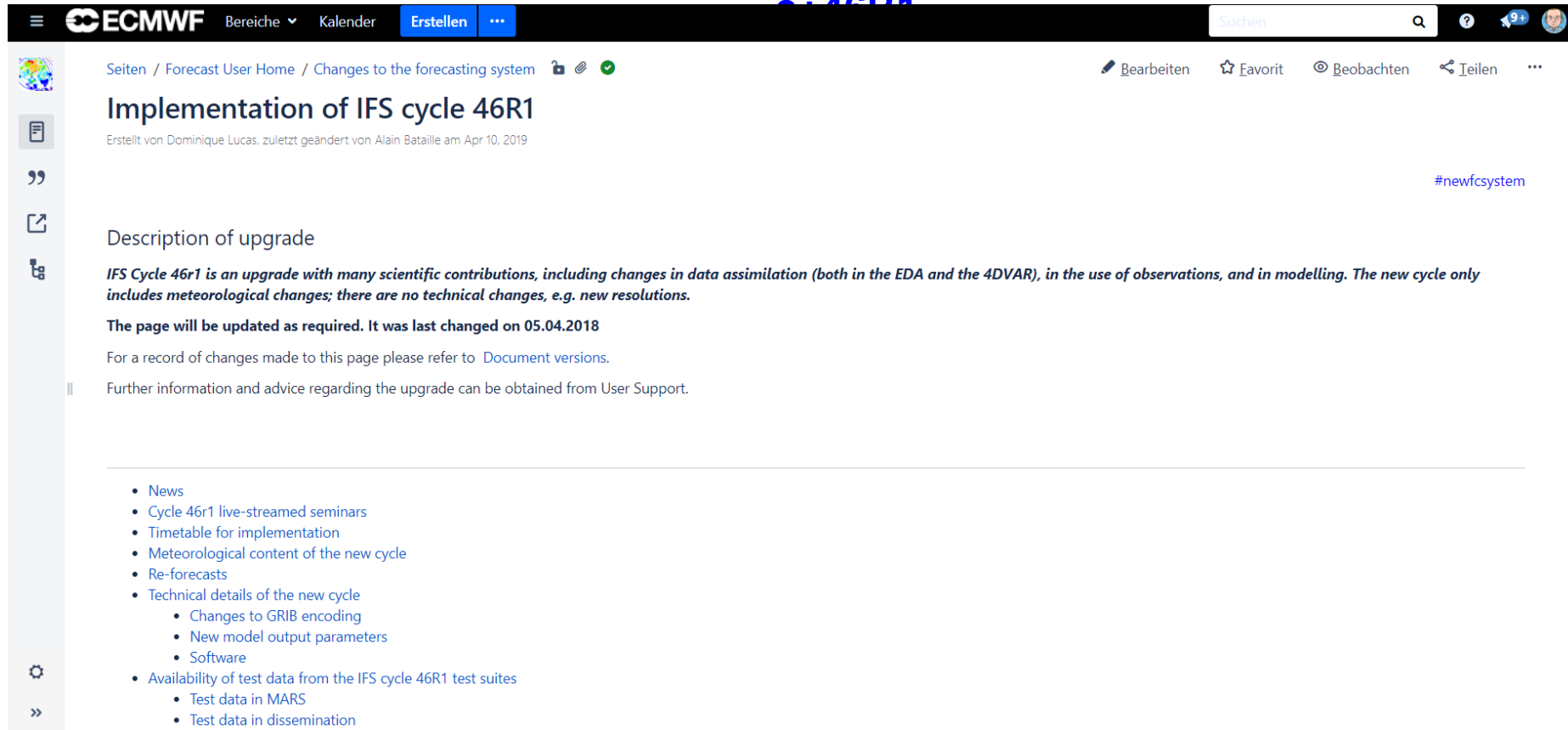
IMPLEMENTATION on 11th June 2019



Information to new cycle 46R1

All information is published on the website

<https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+cycl>



The screenshot shows the ECMWF Confluence interface. The top navigation bar includes the ECMWF logo, a menu, 'Bereiche', 'Kalender', 'Erstellen', and a search bar. The page title is 'Implementation of IFS cycle 46R1', created by Dominique Lucas and last updated by Alain Bataille on April 10, 2019. The page content includes a description of the upgrade, a list of changes, and a list of links for further information.

Seiten / Forecast User Home / Changes to the forecasting system

Implementation of IFS cycle 46R1

Erstellt von Dominique Lucas, zuletzt geändert von Alain Bataille am Apr 10, 2019

#newfcsystem

Description of upgrade

IFS Cycle 46r1 is an upgrade with many scientific contributions, including changes in data assimilation (both in the EDA and the 4DVAR), in the use of observations, and in modelling. The new cycle only includes meteorological changes; there are no technical changes, e.g. new resolutions.

The page will be updated as required. It was last changed on 05.04.2018

For a record of changes made to this page please refer to [Document versions](#).

Further information and advice regarding the upgrade can be obtained from User Support.

- News
- Cycle 46r1 live-streamed seminars
- Timetable for implementation
- Meteorological content of the new cycle
- Re-forecasts
- Technical details of the new cycle
 - Changes to GRIB encoding
 - New model output parameters
 - Software
- Availability of test data from the IFS cycle 46R1 test suites
 - Test data in MARS
 - Test data in dissemination

Webinars on Science and Implementation (Reminder)



Download Presentation
or/and
Watch recording

The screenshot shows a webinar interface. On the left is a sidebar titled 'Events Index' with a search bar, 'Filter Events' dropdown, and a checked 'Chat Messages' option. Below this is a 'Presentation [0:00:00]' section. The main area displays the title 'Cycle 46R1 overview' and the presenter 'Andy Brown, Director of Research' with the ECMWF logo. On the right, there is a 'Video (1)' window showing a live feed of Andy Brown and a 'Chat (Everyone)' window with messages from technical support and participants. The bottom of the interface features a video player control bar with a play button, a progress bar, and a timestamp of 0:00:08/0:36:02.

Cycle 46r1 live-streamed seminars

We will organise two live-streamed seminars to introduce the new IFS cycle 46r1. The first seminar has mainly covered the Scientific changes made in the new Cycle (see recording and slides below). The second seminar will focus more on the meteorological impact and scores of the new cycle, with details on how to access the Cycle 46r1 release candidate test data. This second seminar will take place on Wednesday, 15.05.2019 at 09:30 BST and repeated on Thursday, 16.05.2019 at 17:00 BST. You will have the opportunity to raise any questions during all these seminars. Please do not hesitate to contact us for additional questions.

To attend any of these seminars, please follow the link below:

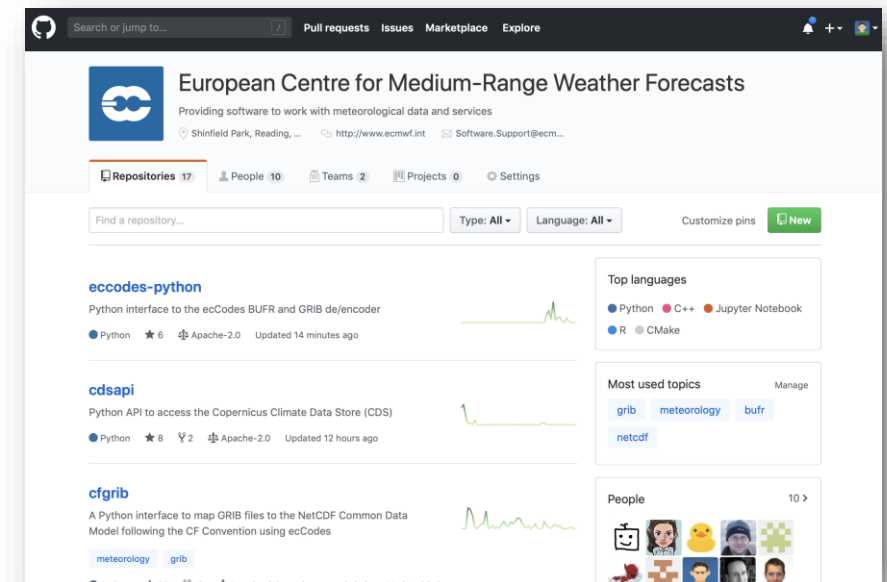
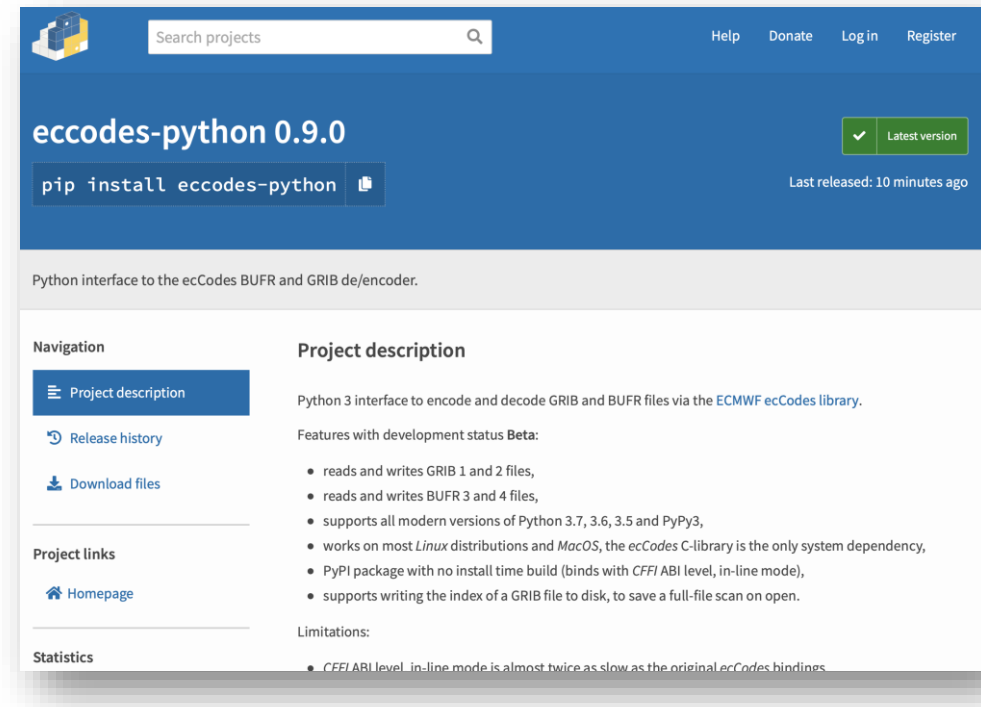
<https://ecmwf.adobeconnect.com/ecmwf-46r1>

There is no need to pre-register.

The recording of the first cycle 46r1 seminar is available at <https://ecmwf.adobeconnect.com/pgy081jw03ya/>. The presentation slides are also available separately at https://www.ecmwf.int/sites/default/files/medialibrary/2019-02/46r1_overview_AndyBrown.pdf.

ecCodes new Python interface & GitHub

- CFFI based
 - Separates Python interface from main source code
 - Full Python 3 compatible & all functionality of Python 2 interface
 - We suggest Python 2 users to continue with old interface
- **Now also under Windows**
- ECMWF now offers their codes through GitHub
 - <https://github.com/ecmwf>
- Allows users to see up-to-date codes, fork & issue pull requests
- Automatic tests with repos
 - TravisCI (Linux & MacOS) and AppVeyor (Windows)



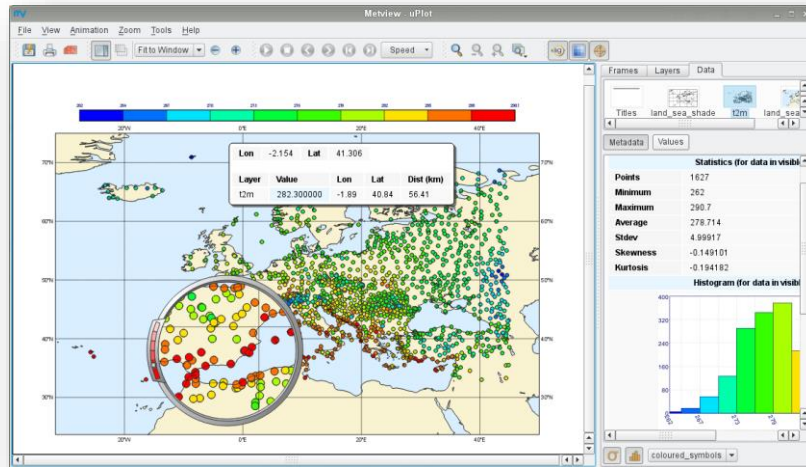
cfgrid – linking xarray and ecCodes

- Essential building block to bring GRIB model output data in the PyData stack
- To embrace xarray for all our field data, we needed to know that we could handle all our GRIB data

The image shows two overlapping GitHub repository pages. The top page is for `ecmwf / cfgrid`, a Python interface to map GRIB files to the NetCDF Common Data Model. It shows 699 commits, 2 branches, 22 releases, and 2 contributors. The bottom page is for `pydata / xarray`, showing a pull request titled "Add a GRIB backend via ECMWF cfgrid / ecCodes #2476". The pull request is merged and shows a comment from alexamici detailing the work in progress, including adding read support, tests, and documentation. The pull request also shows 29 commits, 0 checks, and 11 files changed. The right sidebar of the pull request shows reviewers (shoyer, jhamman, StephanSiemen), assignees (none), labels (backends), and projects (none).

The Metview Python framework

- A high-level Python 3 interface for processing and visualising ECMWF data
→ makes use of all other packages
- Aim is to allow users of Metview to use easily the power of Python but still have all functionality of Metview; including visualisation



```
jupyter Untitled Last Checkpoint: an hour ago (unsaved changes) Python 3

File Edit View Insert Cell Kernel Widgets Help

In [2]: import metview as mv

In [29]: t = mv.read('2m_temperature.grib')
print(mv.datainfo(t))
[[{'in': '2m_temperature.grib', 'out': '2m_temperature.grib', 'proportion_present': '1', 'proportion_missing': '0'}]]

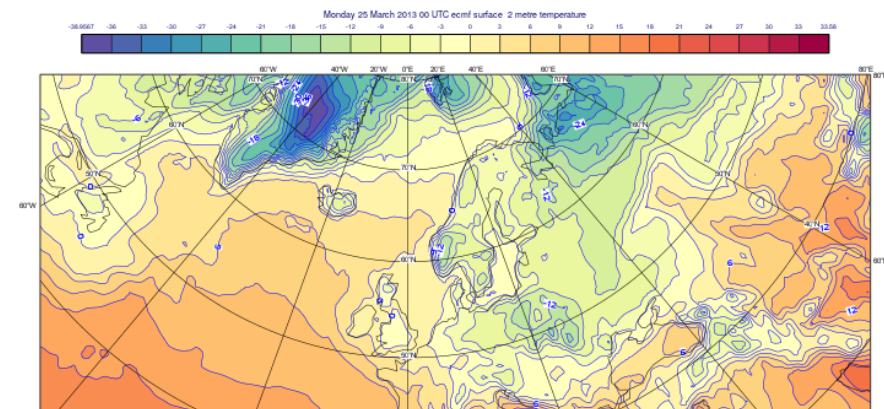
In [30]: pal = mv.datainfo(t)
mv.cross_section
mv.datainfo
mv.date
mv.dates
mv.day
mv.db_info
mv.definition
mv.describe
mv.det
mv.dictionary

polar = mv.geoview(
    map_projection = "polar_stereographic",
    map_area_definition = "corners",
    area = [19.62, -31.44, 39.66, 80.1])
```

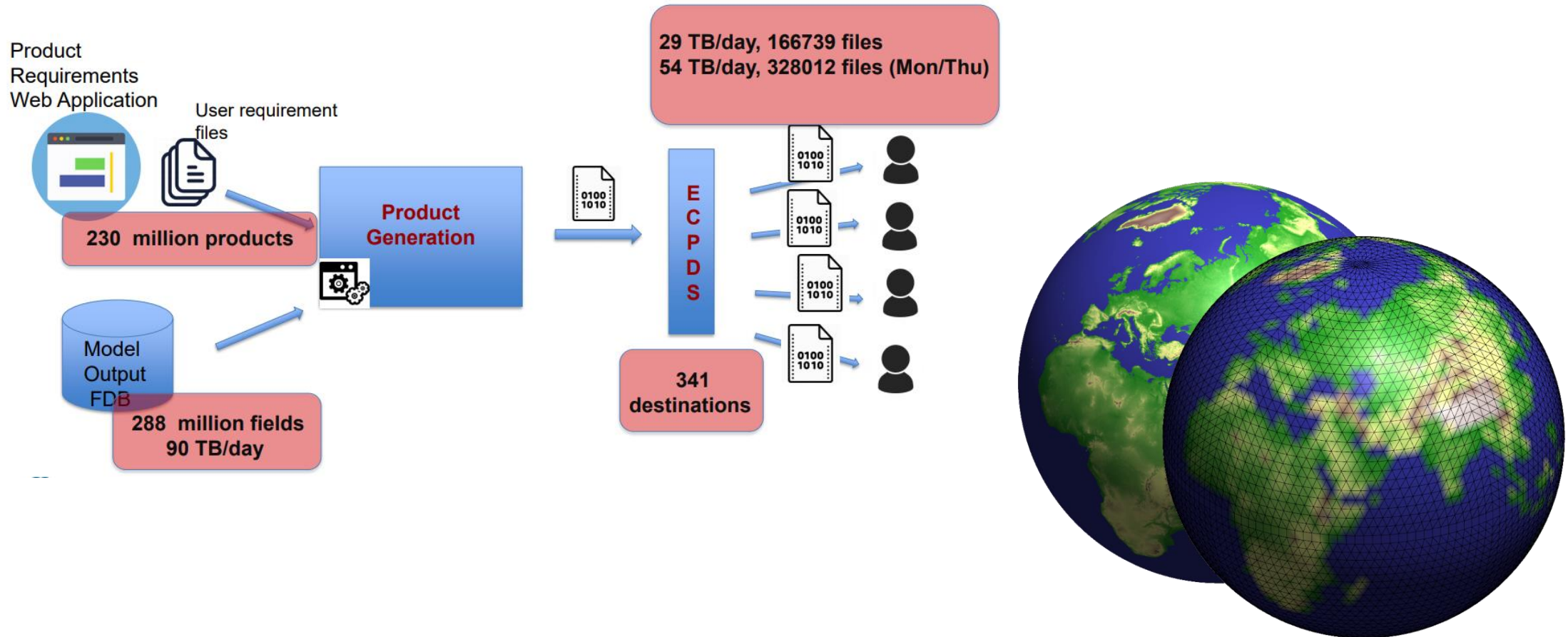
To view your plot in a Jupyter notebook, call "mv.setoutput('jupyter')" at some point before plotting

```
In [31]: mv.setoutput('jupyter')
mv.plot(polar, t, pal)
```

Out[31]:



New product Generation & Interpolation Software (MIR)



Disseminate our data to you

ECMWF has currently a fixed dissemination schedule determining at which time individual products are released

This fixed schedule has served us well and allowed the arrival of ECMWF products to be predictable which has been considered an advantage

Many of our data users have asked to have products earlier

We are now in a position to consider this request and we would like to collect some feedback on this. ← Visit the interactive poster by Jenny Rourke in the weather room

**Early availability of ECMWF data
“interactive poster”**

Dr Jenny Rourke
Head of Production Services Section, ECMWF, Reading, United Kingdom



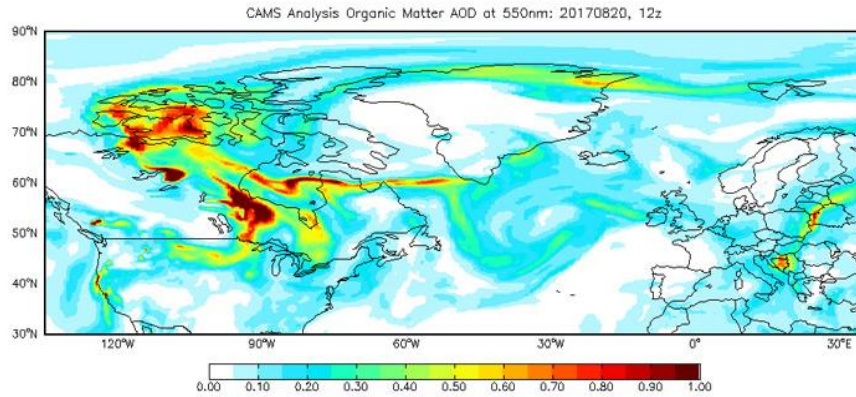


Copernicus



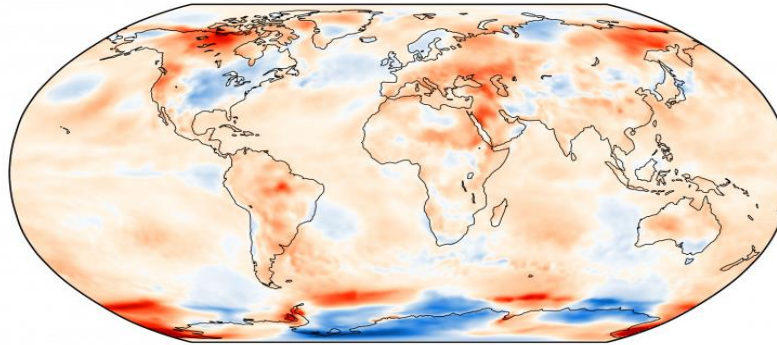
Working with the EU: Environmental information

Atmosphere Monitoring Service (CAMS)



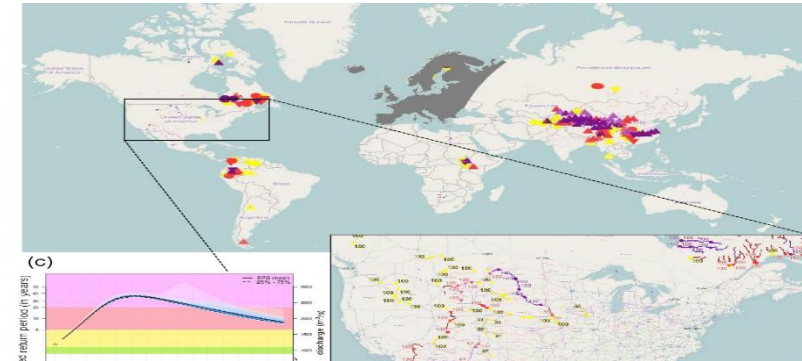
High-resolution mean sea level
pressure and ensemble spread

Climate Change Service (C3S)



Total precipitation (mm) –
ensemble distribution

Flood and fire forecasting (CEMS)

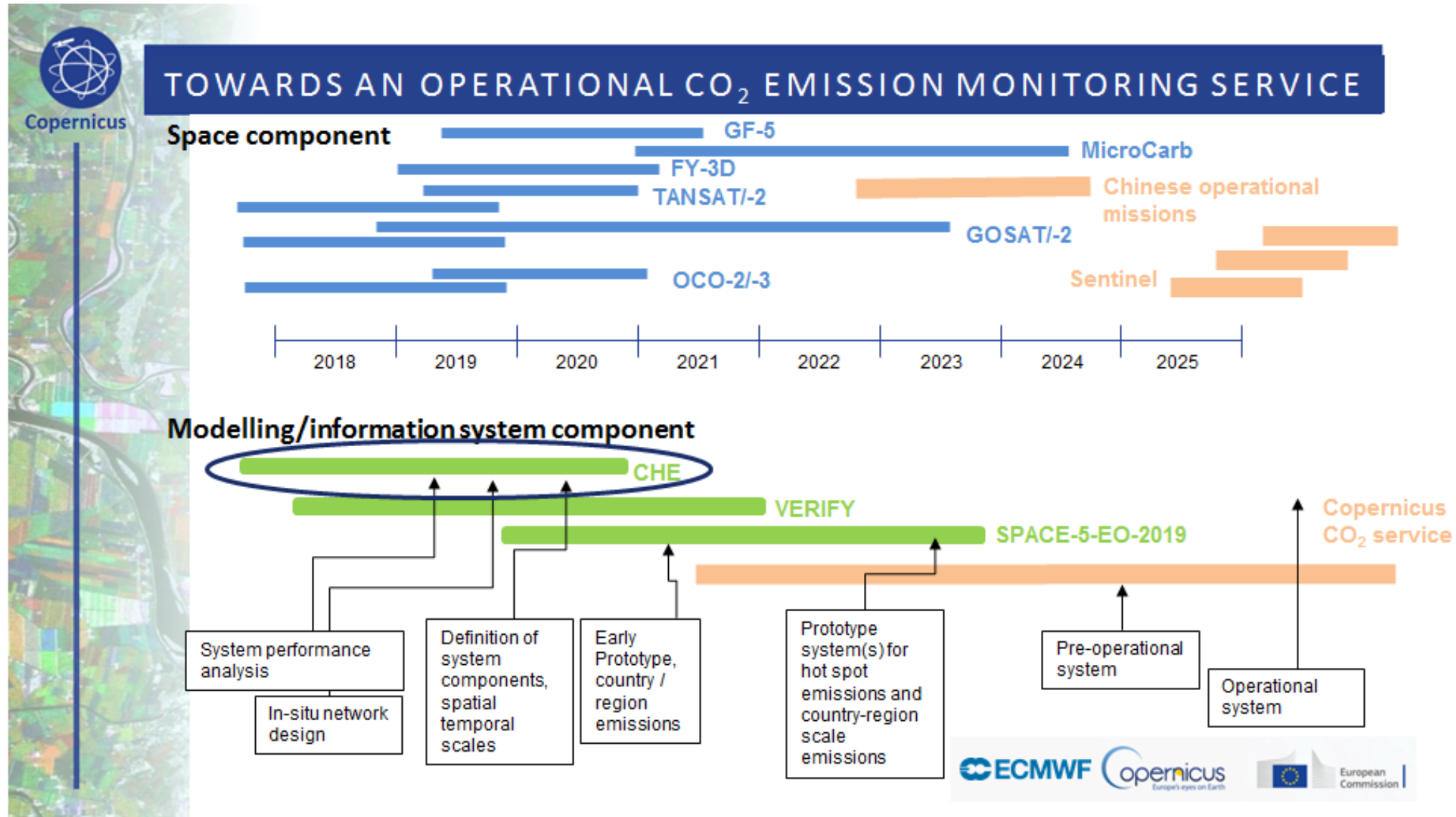


Main GloFAS interface

Establishment of User Needs / Requirements for Copernicus evolution

- The EC conducted in 2016-17 a wide initiative to identify long term, “user-driven” requirements for evolution of Copernicus services and space segment => user consultations, workshops, etc.
- Copernicus will continue to be a public service, driven by the needs of policy and public administrations, and fostering economic development in Europe
- Stability of the programme and long term commitment
 - (Enhanced) continuity of current data and services;
 - Continuity of full, open and free data policy
- Emerging needs
 - Climate change and sustainable development;
 - Monitoring CO2 and other greenhouse gas emissions;
 - Land use and forestry;
 - Changes in the Arctic;
 - Security and Defence: Improving the EU's capacity (border control, maritime surveillance);

Copernicus development, example of CO₂ monitoring





ECMWF: the STRENGTH OF A COMMON GOAL

#UEF2019