

Status and summary of the Pilot

European Weather Cloud User Workshop

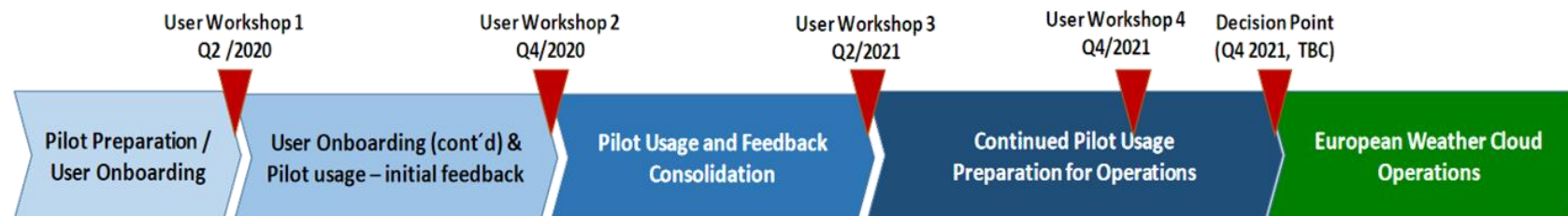
November 10-11, 2021

Roberto Cuccu (ECMWF) , Roope Tervo (EUMETSAT)

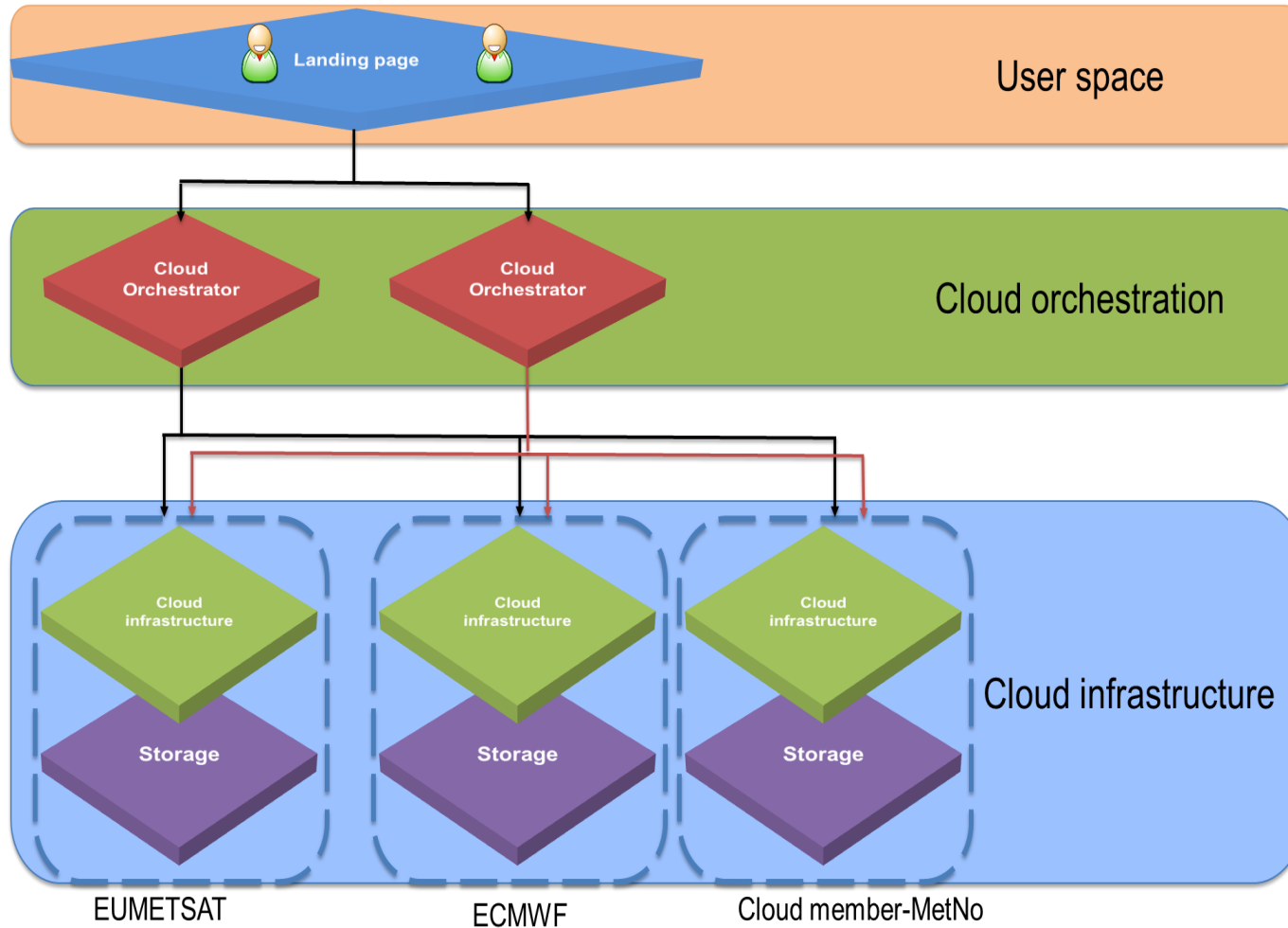


- Three-year pilot project started in January 2019 -ECMWF and EUMETSAT
 - Basic goal is to **bring the computation resources (Cloud) closer to the data** (meteorological archive and satellite data)

- The Pilot project includes:
 - Building infrastructure
 - Hosting and supporting use cases
 - Gather feedback and prepare for next phases

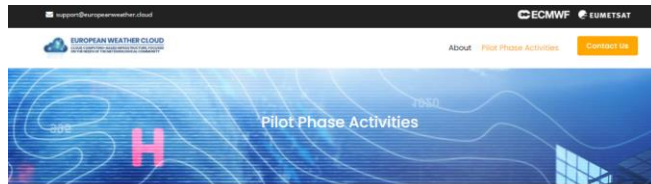


High Level Design and users entry point



Underline cloud infrastructures not directly accessible by the users

Cloud Management Orchestrator - Morpheus



EUMETSAT

Operations Provisioning Infrastructure Backups Logs Monitoring Tools Administration

Instances Apps Blueprints Jobs Automation Virtual Images Library Deployments Service Mesh

ECMWF

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Dashboard Metrics:

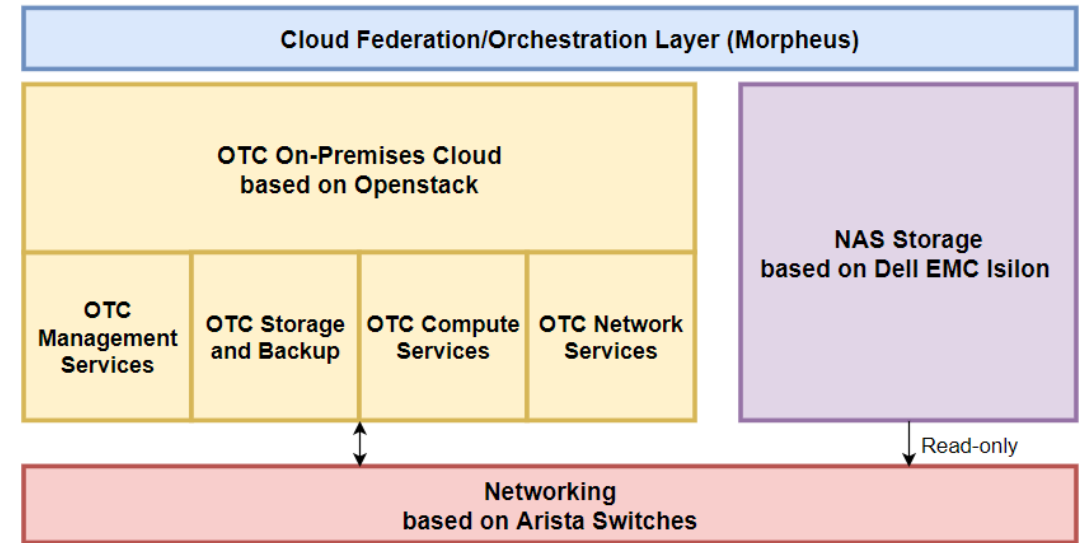
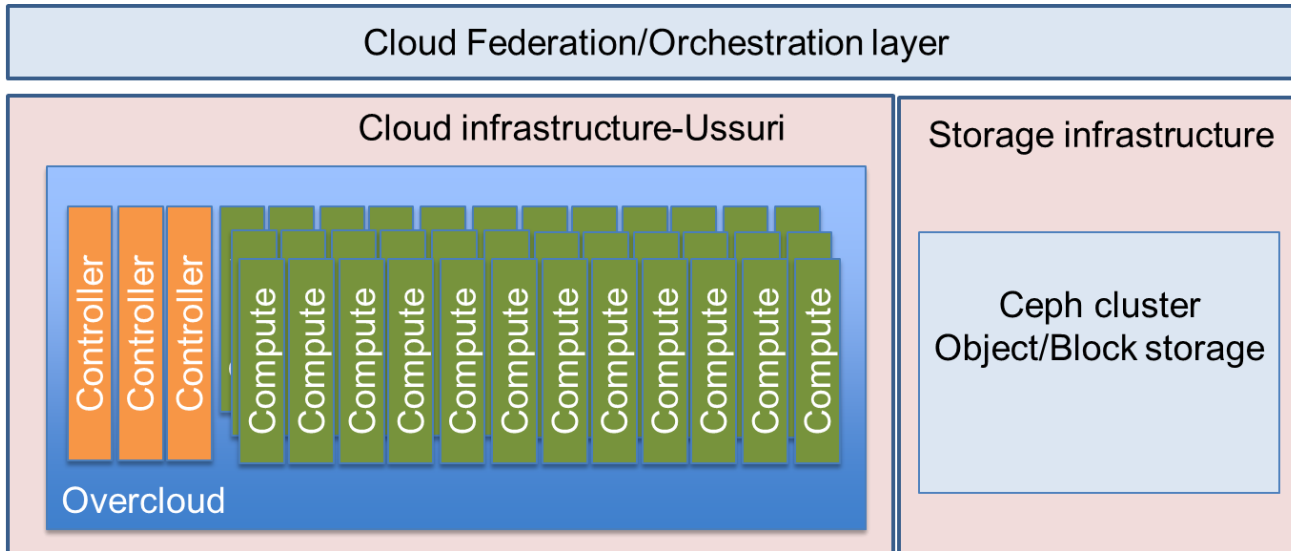
- INSTANCE COUNT: 14
- INSTANCE STATUS: Running 13, Stopped 1
- MAX CPU: 0%
- STORAGE: 19%
- MEMORY: 7%

INSTANCES

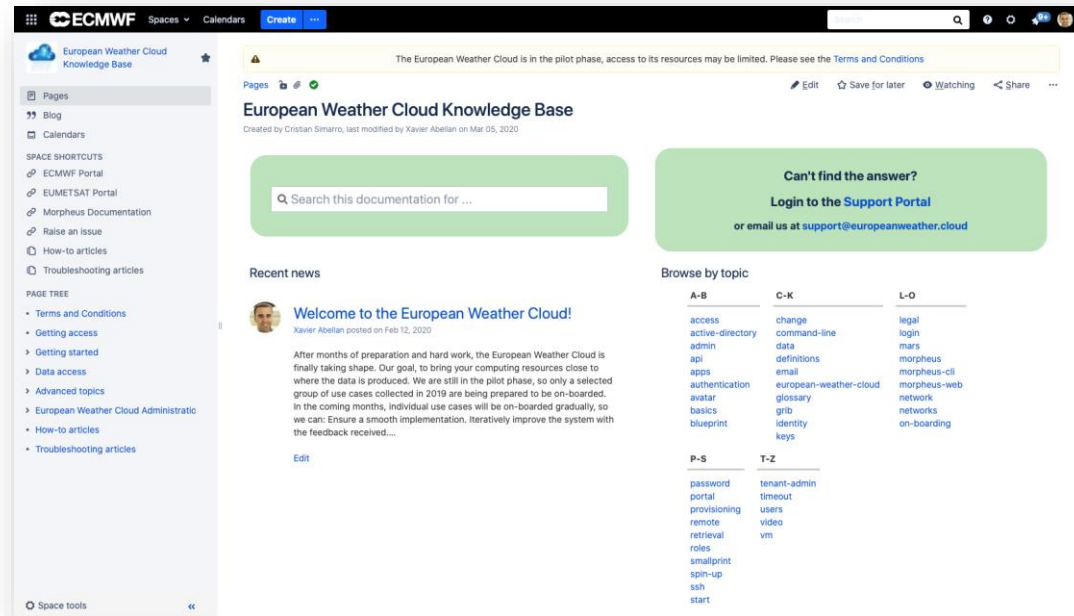
NAME	SUMMARY	LOCATION	STATS
<input type="checkbox"/> aviso Dev	IP addr: 136.156.90.134 Version: 18.04 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 19% STORAGE: 27%
<input type="checkbox"/> aviso-data2 Dev	IP addr: 136.156.90.152 Version: 18.04 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 12% STORAGE: 26%
<input type="checkbox"/> aviso1 Dev	IP addr: 136.156.90.193 Version: 18.04 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 13% STORAGE: 33%
<input type="checkbox"/> baudouin	IP addr: 136.156.90.104 Version: 7.8 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-ecmwf-development	STATUS: ▶ HEALTH: ⚠ MAX CPU: 0% MEMORY: 8% STORAGE: 17%
<input type="checkbox"/> ecpds Test	IP addr: 192.168.1.234 Version: 7.8 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-u-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 2% STORAGE: 2%
<input type="checkbox"/> mamz Production	IP addr: 136.156.91.143 Version: 7.8 Virtual Machines: 1	Group: european-weathercloud Clouds: ecmwf-u-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 31% STORAGE: 26%
<input type="checkbox"/> manuel Production	IP addr: 136.156.90.31 Version: 7.8	Group: european-weathercloud Clouds: ecmwf-ecmwf-development	STATUS: ▶ HEALTH: ✔ MAX CPU: 0% MEMORY: 9% STORAGE: 0%

VISIBILITY	TENANTS	SOURCE	STATUS	ACTIONS
Private	CSMDemo	SYNCED	Queued	ACTIONS
Private	CSMDemo	SYNCED	Active	ACTIONS
Private	de-dvnd-sysadmin	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Queued	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
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Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS
Private	eumetsat-dataprocessing	SYNCED	Active	ACTIONS

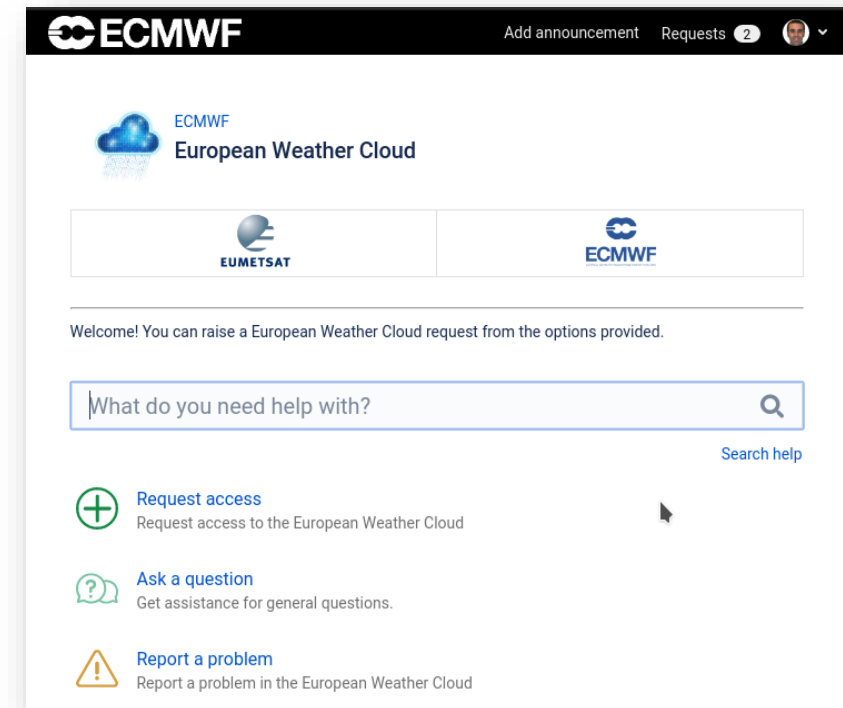
European Weather Cloud Pilot infrastructure



Support services



Knowledge Base



Support Portal

Cloud offer (currently IaaS model in the Pilot)



Cross-clouds resource provisioning

Self provisioning of customisable Virtual Machines (CentOS and Ubuntu)

VM templates with pre-installed software

”Fast-track” data access

Self provisioning of block storage volumes and S3 object storage usage

GPUs instances

Self provisioning of Kubernetes clusters

Cloud orchestrator APIs usage

Integrated automation (e.g. via Ansible)

...and more

44 different kind of use cases in the pilot phase (which of 44 were useful)



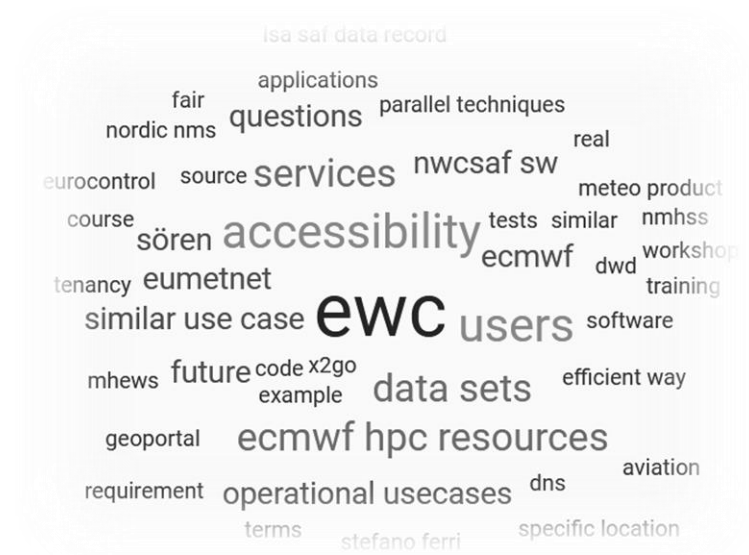
Users Feedback



Feedback collected via: users workshops, surveys, support tickets, monitored cloud usage

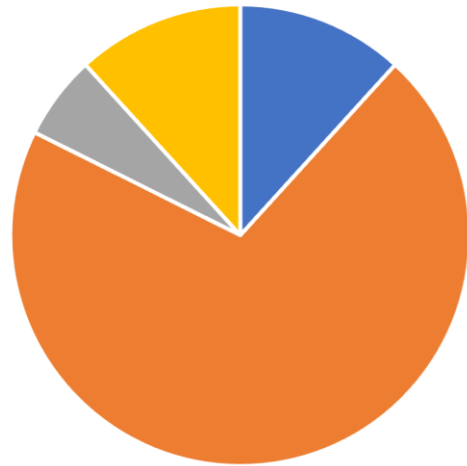
Some major points reported so far:

- Integration with other facilities (e.g. HPC)
- Containers and kubernetes clusters
- Higher level services and predefined building blocks
- Data access and availability
- IT Security and data protection



EWC Pilot - Survey Results

Organization



- Academia
- National Meteorological Hydrological Service
- Other
- SAF

Use or intended use of European Weather Cloud?

Operational systems	<div style="width: 30%; background-color: #0056b3;"></div>
Batch processing (reprocessing, post-processing/extracting subsets of a dataset, etc..)	<div style="width: 35%; background-color: #0056b3;"></div>
Providing a remotely accessible service (e.g. website / web tools, online visualisation)	<div style="width: 30%; background-color: #0056b3;"></div>
Interactive work / collaborative environment	<div style="width: 15%; background-color: #0056b3;"></div>
Training environment	<div style="width: 10%; background-color: #0056b3;"></div>
Machine learning	<div style="width: 25%; background-color: #0056b3;"></div>
Experimentation and exploration of cloud technologies	<div style="width: 40%; background-color: #0056b3;"></div>

Survey Results – Pilot phase



Positive feedback:

- Getting support (initially or for technical help), via Knowledge Base, Support Portal, etc.
- Getting a tenancy
- Exporting results and data out of the cloud

Need improvements:



- Understanding how to use cloud resources for your use case
- Setting up virtual machines, clusters, or any other virtual infrastructure
- Accessing data

Obstacles:

- Insufficient resources (e.g. wanted GPUs, RAM or disk quota too small)
- Technical knowledge and system administration

Survey Results – Next Phases



- Confirmed interest in accessing cloud resources after Pilot phase
- High importance in having access to training courses and workshops on the use of the cloud

Preferred ways to access to the operational European Weather Cloud:

Ask for a share of the national contingent (via Member State Computing Representative)



Apply for an upcoming EUMETSAT R&D call / ECMWF Special Projects



Not sure, I'd like to discuss options



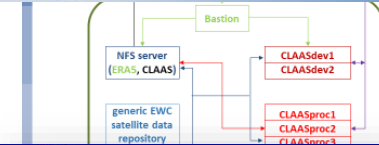
We are looking forward the operational phase

- Carry-ons from the pilot phase
- New and interesting uses we haven't seen yet
- Operational applications
- Projects with longer temporal scope

icon-pre
pre-processing of input data from DWD's operational database and other sources.
- single instance, IO intensive

icon-lam
self-contained, MPI-parallel executable of the ICON limited area model. Ready-to-use for small and medium size setups.
- "virtual cluster" of multiple instances, CPU+network intensive

icon-post
post-processing and basic visualization of limited area ICON runs.
- single instance, IO intensive



KNMI Climate Explorer

Starting point: [www.knmi.nl](#)

Geoportal

Typ: Messwerte (13), Vorhersagen (2)

Max. Abdeckung: Deutschland (14), Europa (3), Global (1)

Parameter: Aktuelles Wetter (Eigebaut...), ALB-DWD - Global im Zeit... (1), ALB_L_S - Luft... (1), Anzahl der Ertage (Maum...), Anzahl der Frontage (Mitt...), Anzahl der Hagelst... (1), Anzahl der Heiße Tage (M...), Anzahl der Sommerge... (1)

Formate, Ressourcen, Kategorien, Vorhersagezeitraum

COSSMO-02: Mit dem COSSMO-02 verfügt der DWD über ein Modell für Vorhersagen im Kilozentimeter bis +27 Stunden (bis +45 Stunden aus dem 100 UPO-Clock). Mit seiner...

ICON-EU: Am 21.07.2019 hat der DWD im globalen ICON die ICON-EU. Hier in den operativen Bereich genommen. Das CON-EU-Regime (mit mittels zwei Wege-Ausgabe) "Phan...

Gemeindeforwarnungen: Der Deutsche Wetterdienst verfügt über 238...

Waldbrandgefahrenindex: Der Waldbrandgefahrenindex (WBI) beschreibt das meteorologische Potenzial für die Gefährdung durch Waldbrände...

Radar-Niederschlagsgen: Der DWD betreibt im Rahmen der Atmosphärenforschung einen Verbund aus 17 operativen Wetterradar...

The CM SAF R TOOLBOX
— R-based tools for an easy usage of CM SAF NetCDF data —

PREPARE
Fetch, unzip, select time and region, merge.

ANALYSE
The cmcscf R-package contains more than 60 useful operators.

VISUALIZE
Visualize spatial data, statistical analysis and 1D-timeseries.

Climate Data Record Production
Precipitation and land turbulent heat fluxes derived

(a) CMA: CLAAS-2: mean (0.0 (cloudy) to 1.0 (clear))
(b) CPH: CLAAS-2: mean (0.0 (liq) to 1.0 (ice))

Content courtesy of Johannes Kaiser, CM SAF DWD

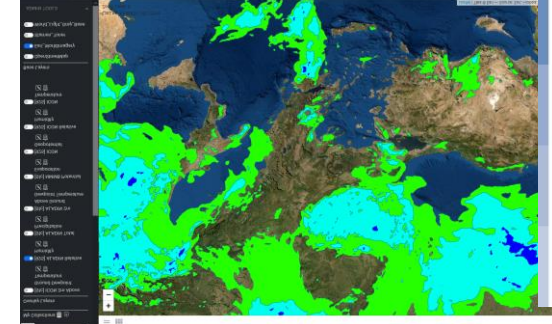
Bernas, N., Finkenstäder, S., Stengel, M., van Zedelhoff, G.-J., Hanschmann, T., Hoffmann, R., and Meerk, S. P.: The RSD-RECORD based project data record CLAAS-2, Earth Syst. Sci. Data, 9, 415–434, <https://doi.org/10.5194/essd-9-415-2017>, 2017.

ECMWF EUMETSAT CM SAF training workshop

ECMWF EUMETSAT CM SAF training workshop

- Use of EWC solved major issues in hands-on sessions
- No need to download huge data files across the network and to handle large datasets on PCs / laptops
- Computing environment prepared once, works for all
- Equal access to the computing environment from anywhere
- Users can evaluate their use case prior to investment

Results achieved by users after 2 hours in the session



Earthquake in Zagreb: Support to DHMZ

With input from Izidor Pelajić

EUROPEAN WEATHER CLOUD
EUMETSAT