



Copernicus Thematic Hub on Energy

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ECMWF

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PROGRAMME OF
THE EUROPEAN UNION

Europe's eyes on Earth

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ATHENS 7-9 DECEMBER 2022



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Space
Component



CLIMATE CHANGE



MARINE MONITORING



ATMOSPHERE MONITORING



LAND MONITORING



SECURITY



EMERGENCY MANAGEMENT



Copernicus Thematic Hubs

❖ **single entry point** for the ensemble of data, products and information generated by the Copernicus services and components (e.g. ESA and EUMETSAT) for **specific thematic or geographical areas**

❖ traceable back to specific EU policy needs

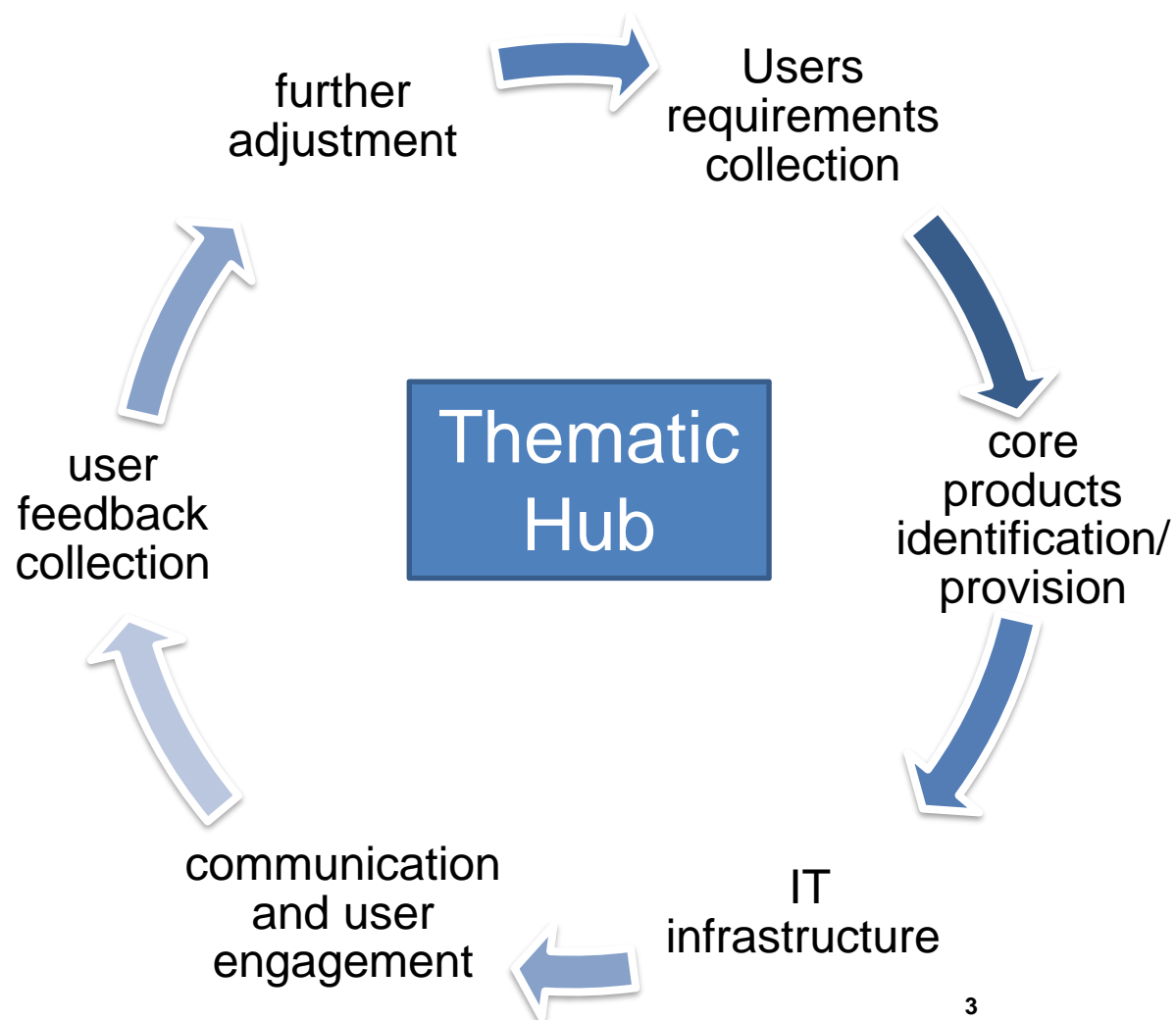
❖ **simplified access** to key information on selected areas of interest for various stakeholders, policy makers and users

❖ **incremental approach:**

- > Proof-of-concept phase (1 year)
- > consolidation phase

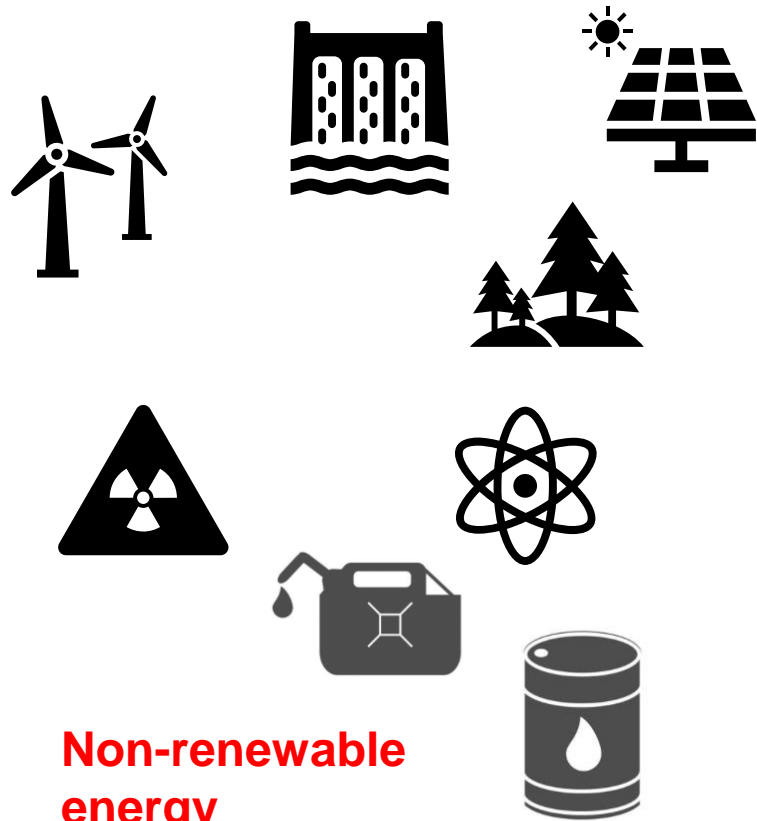
❖ **3-step process:**

- > contribution (all services)
- > collection (1 Entrusted Entity)
- > coordination (KCEO)



Topics addressed by the Thematic Hub on Energy

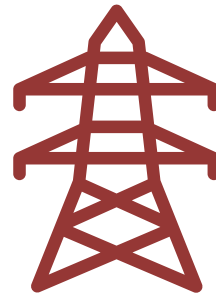
Renewable energy



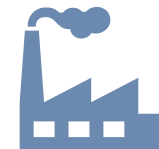
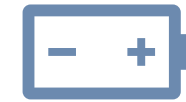
Non-renewable energy



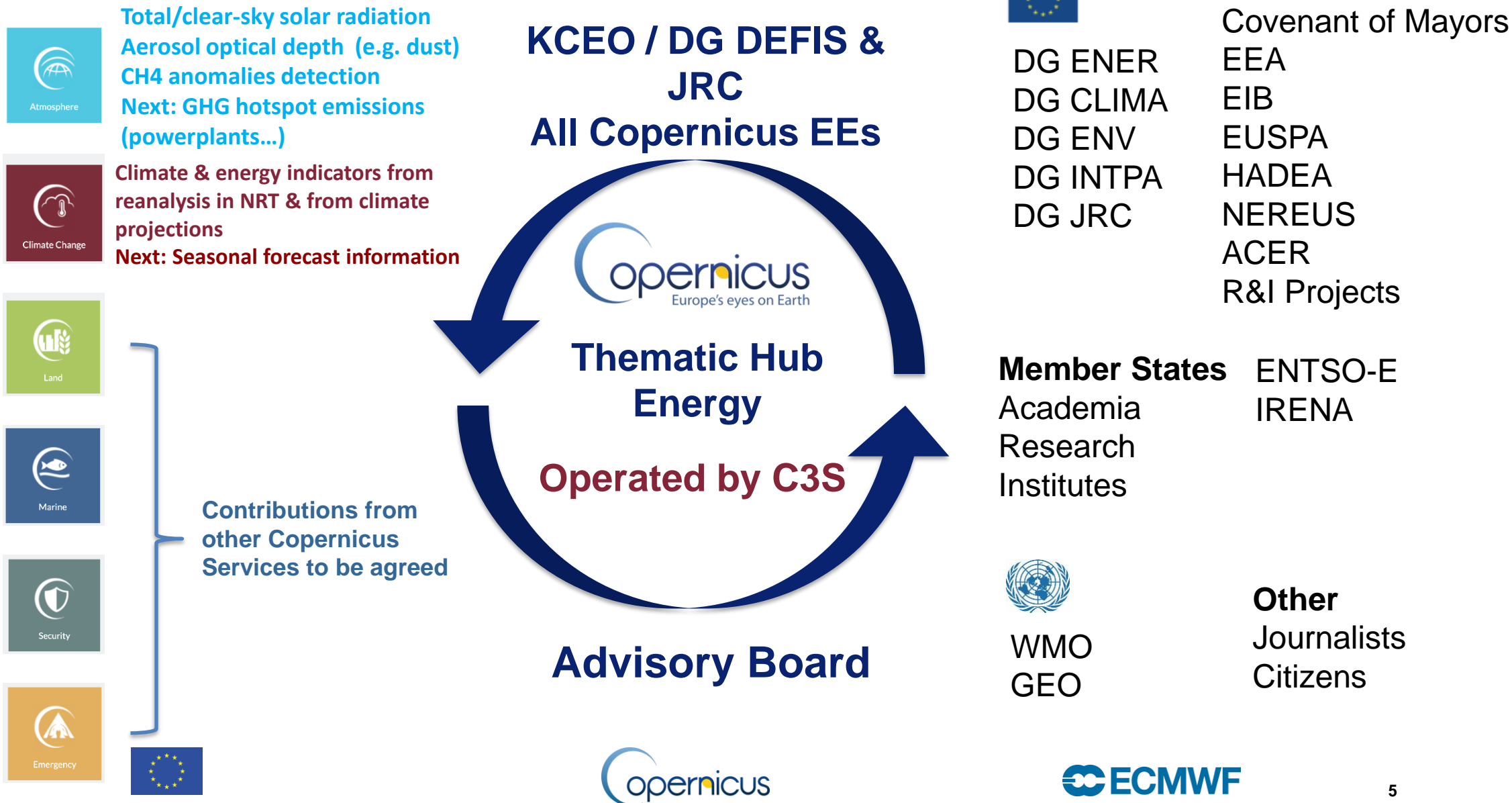
Transmission and Distribution (transport and infrastructures)



Storage and consumption; incl. waste and emissions



Thematic Hub on Energy: Preliminary Supply / Demand Mapping





Atmosphere
Monitoring

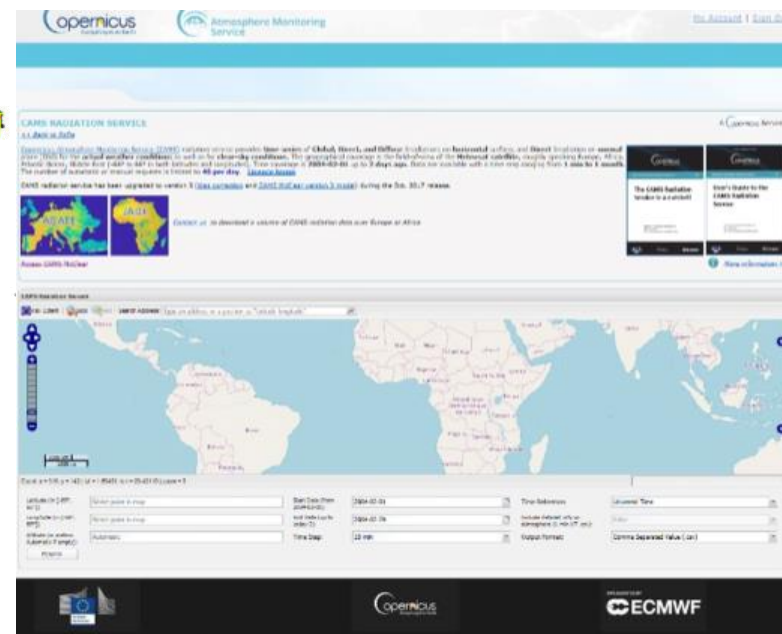
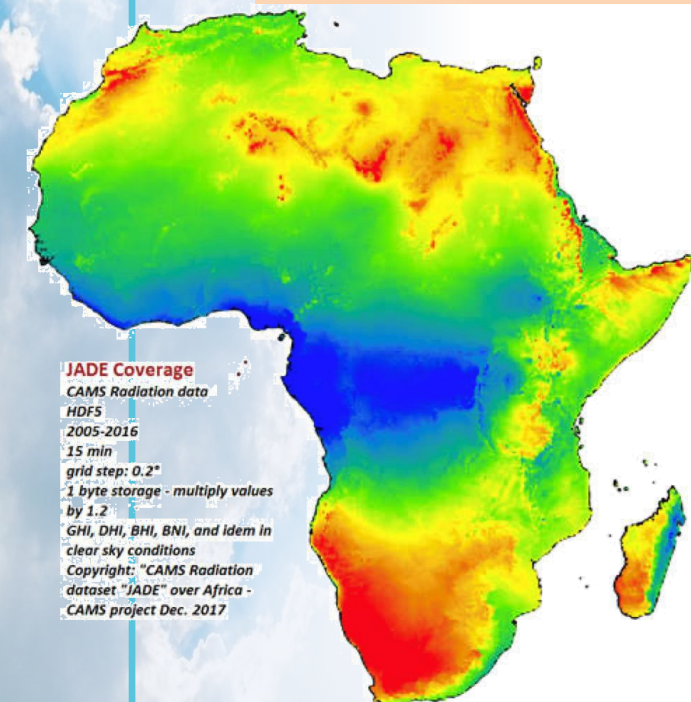
Building on existing products and services

SOLAR ENERGY

Needs: Where available? How much? Annual or montly sums in early planning stages, including time series, variability for detailed system, storage and grid design.

World wide

Data fusion with forecast/other data sources



CAMS provides a full range of solar radiation services supporting site search, design, and operations.

- Global, diffuse, direct and direct normal irradiation
- Time series (2004 onwards) 1min, 15 min, 1h, 1day, 1 month temporal resolution
- Any point within satellite field of view in Europe/Africa
- CAMS incorporate effects of time-dependent aerosol (not climatologies)

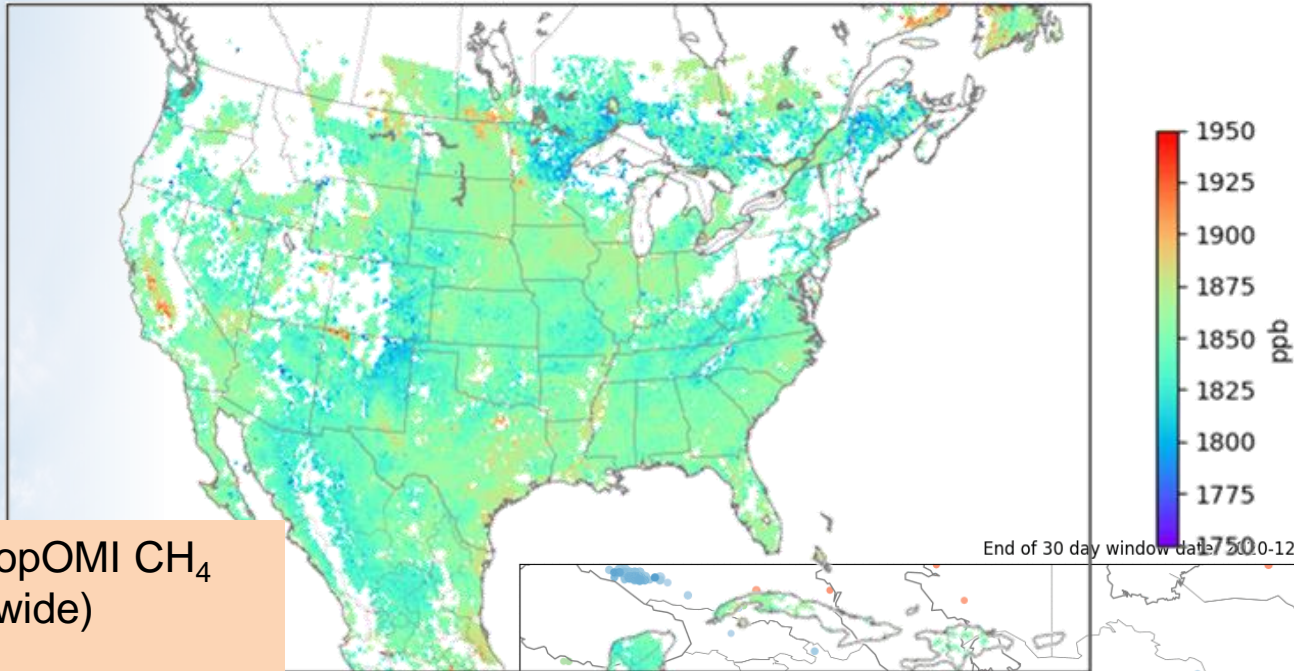
Example of a solar atlas generated from CAMS radiation products (DLR).



Atmosphere
Monitoring

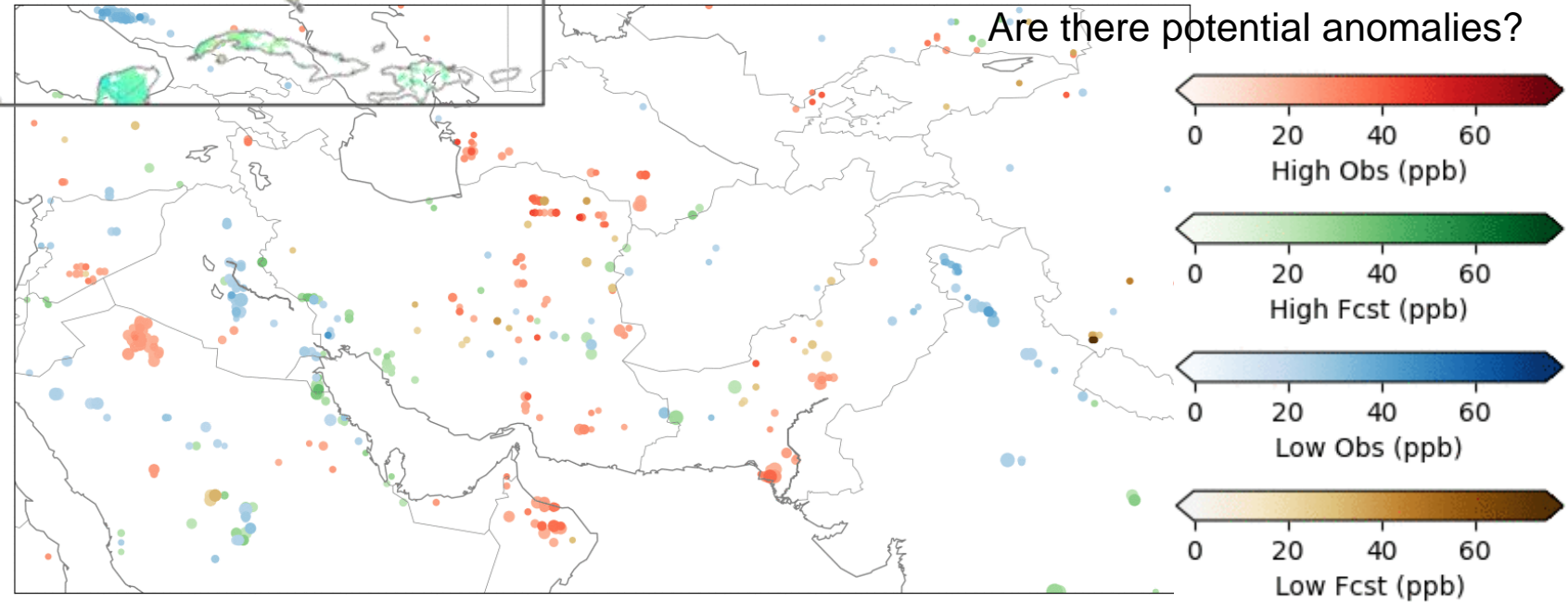
METHANE “ANOMALIES” DETECTION

TropOMI Monitoring Jan_2019 Mean Observation values



Do model “expected” CH₄ concentrations and incoming Sentinel-5P observations differ?

Are there potential anomalies?



Sentinel-5P/TropOMI CH₄ product (worldwide)

- Unprecedented pixel size (5 km x 3.5 km)
- Monitoring against CAMS forecasts pivotal to improve the processing: biases (due to clouds, surface temperature, surface reflectance...) depend upon location, season



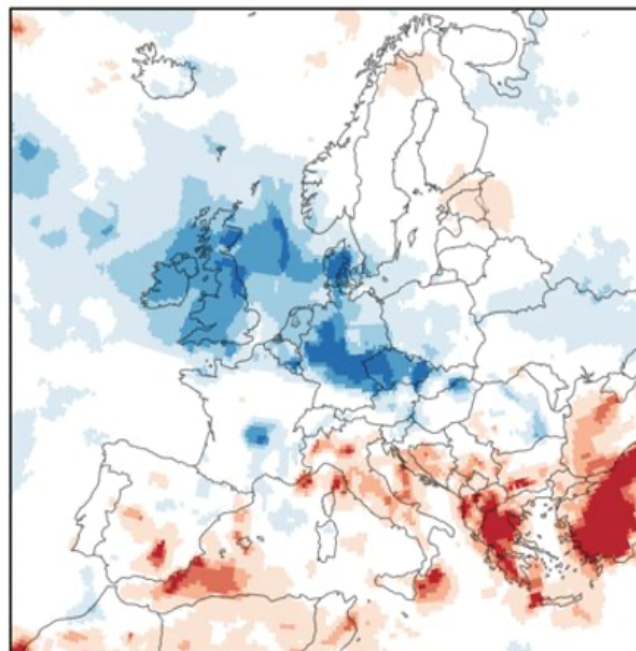
Climate
Change

Climate Monitoring from ESOTC 2021 – Low wind

100m wind speed rankings in 2021

within the 43-year record (1979-2021)

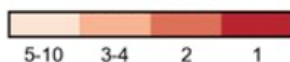
Annual mean



10 lowest wind speeds

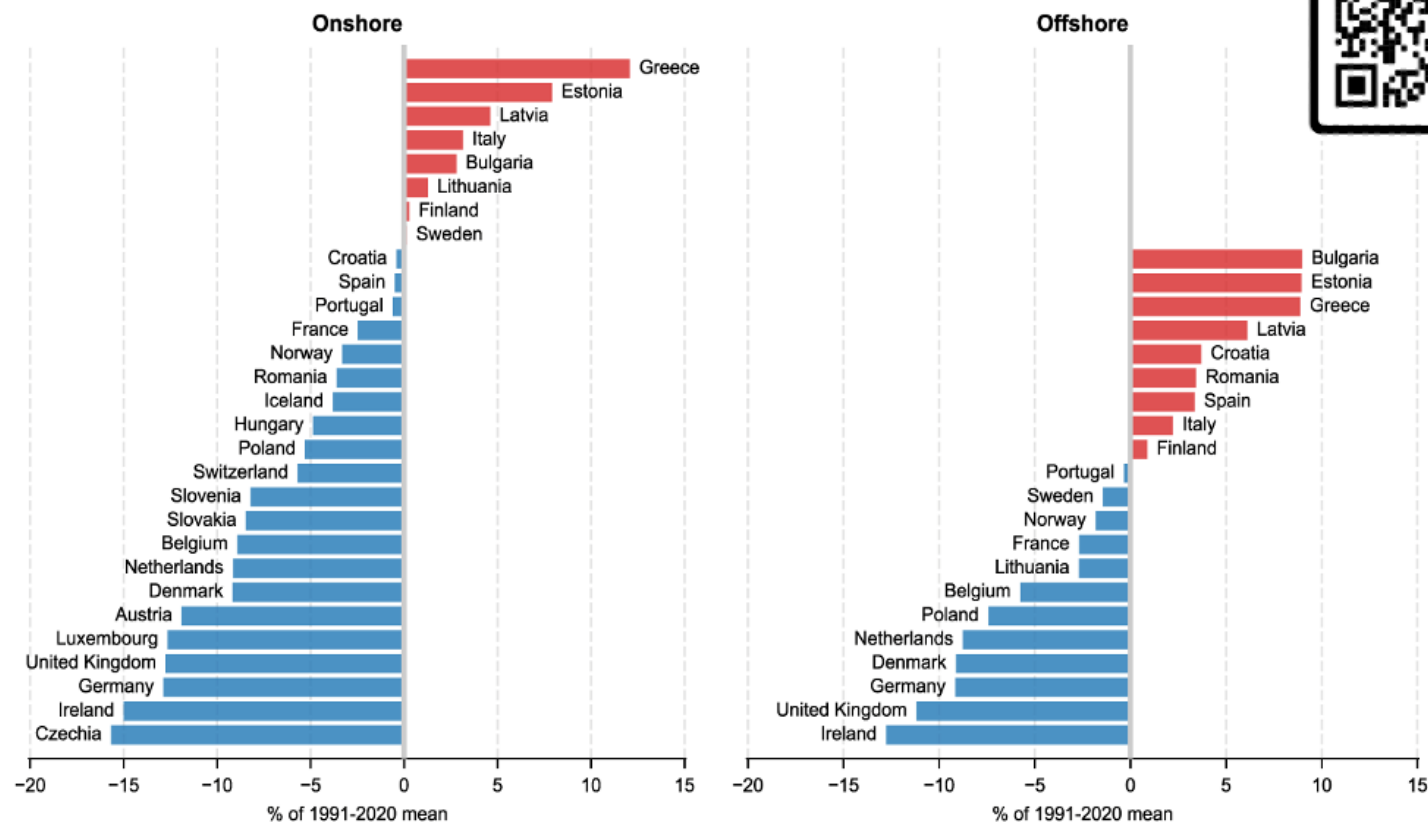


10 highest wind speeds



Wind speed and wind capacity factor derived from ERA5 reanalysis data set

Annual wind capacity factor (CF) anomalies by country in 2021



European State of the Climate 2021, Copernicus Climate Change Service, Full report: climate.copernicus.eu/ESOTC/2021



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implemented by



The existing C3S Operational Service for the Energy Sector



Climate Change

Information on:

- Key meteorological variables
- Energy related variables: energy demand and production from solar, wind, hydropower

Timescale: Past period, Near Real Time, Possible future evolution scenarios

Domain: a multi-variable, multi-timescale view of the climate and energy systems

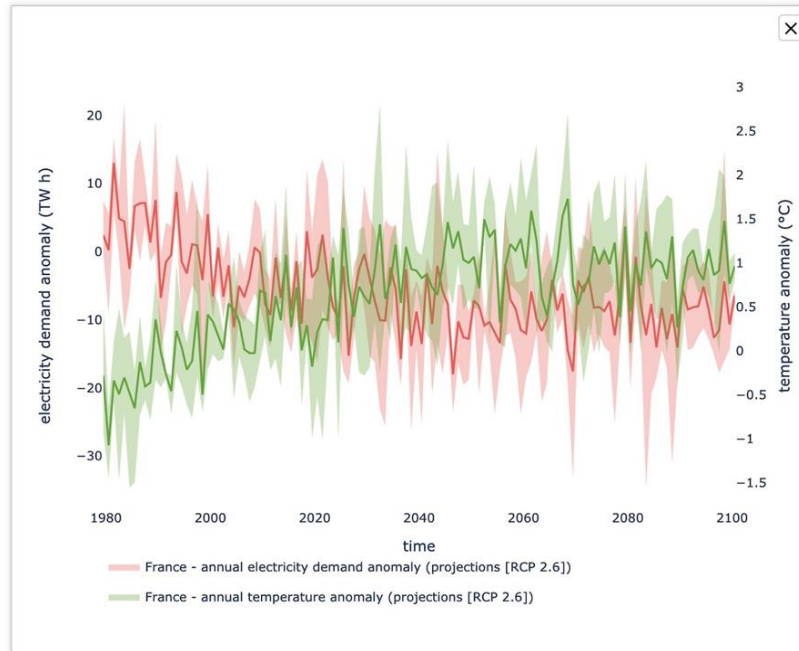
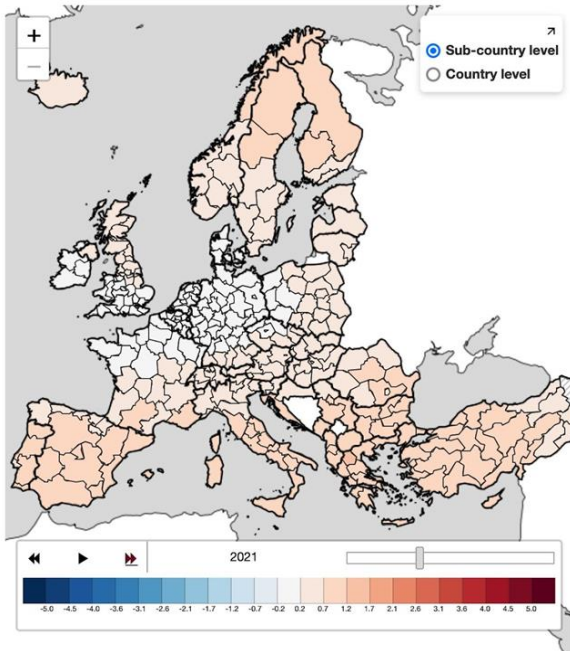
Further needs: Efficiency & Simplicity

C3S provide:

Climate & energy variables from reanalyses, regional climate projections, and multi-model seasonal forecasts.

Core users: EU Agency for the Cooperation of Energy Regulators (ACER)
ENTSO-E (European network of transmission system operators for electricity).

Available Service for Europe only
Plans to extend it to the global scale



Climate and Atmosphere Data Store (CADS)

The **Climate and Atmosphere Data Store (CADS)** integrates the existing Climate Data Store (CDS) and Atmosphere Data Store (ADS)

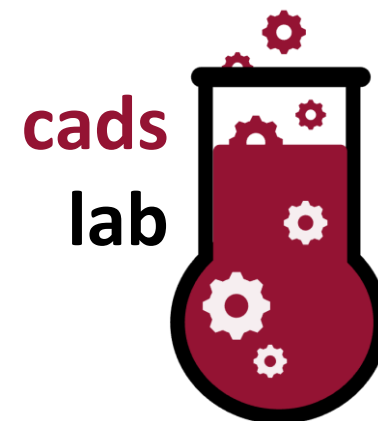


improved **interface** and **exploration** of ever-growing **catalogue** of data



cads toolbox

open-source Python tools for data **access**, **analysis** and **visualisation**



cloud resources and web interface underpinned by **Jupyter notebooks**





Thank you