EUMETNET OPERA – Renewal of the Production Lines

EDERA Final Workshop

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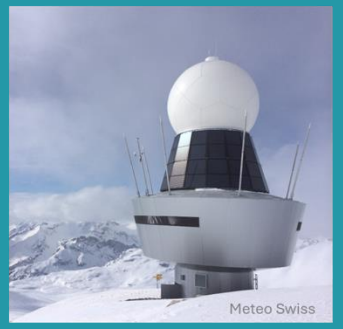
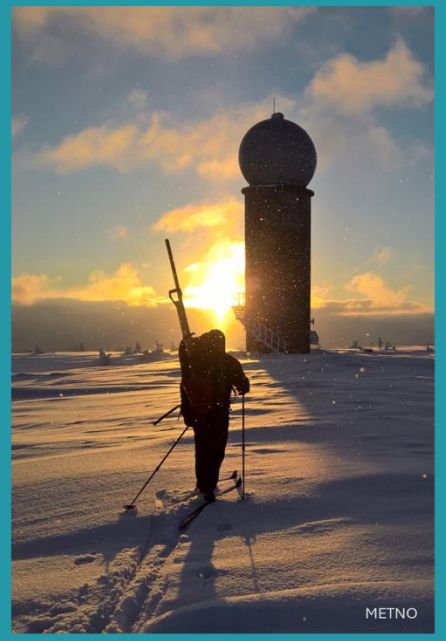
OPERA
(Operational Program on the Exchange of Weather Radar Information)

- The weather radar programme of European Meteorological Services Network, EUMETNET (www.eumetnet.eu/opera)
- established in 1999
- OPERA has currently 32 members operating over 200 radars





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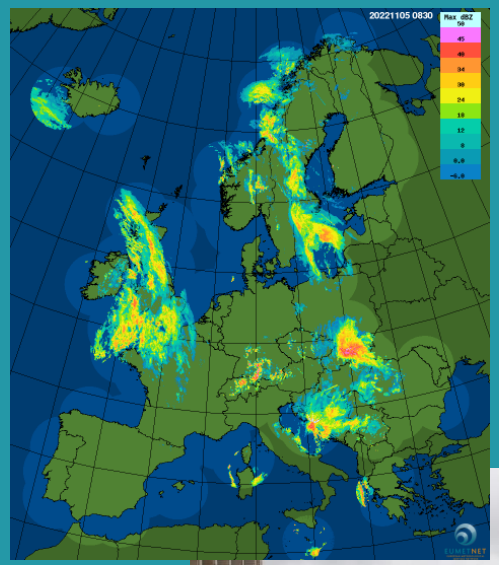
Main objectives of OPERA



- to provide a European platform wherein expertise on scientific and operationally-oriented weather radar issues is exchanged
- to support European radar network management in monitoring, collection, processing, and supply of weather radar data
- to develop, generate and supply high-quality pan-European weather radar products on an operational basis

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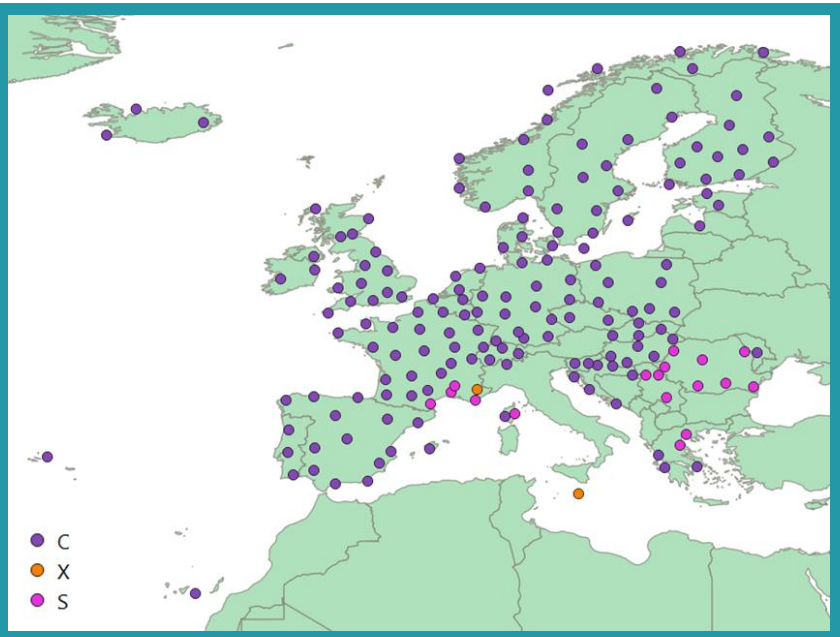
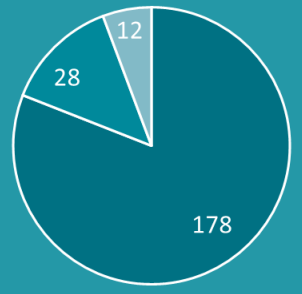
Currently in OPERA

- Exchanging
  - i) unfiltered reflectivity TH
  - ii) “Best possible” reflectivity DBZH (since 2017)
  - iii) Radial velocity VRADH
- Scans mostly every 5 minutes and exchanged sweep-by-sweep/radar volumes
- 340 000 files/day, 60 GB -> archive of 200TB
- Number of radars: 219 → Active radars: 181

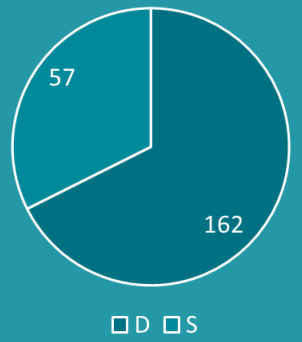


Frequency band



Doppler

Polarization



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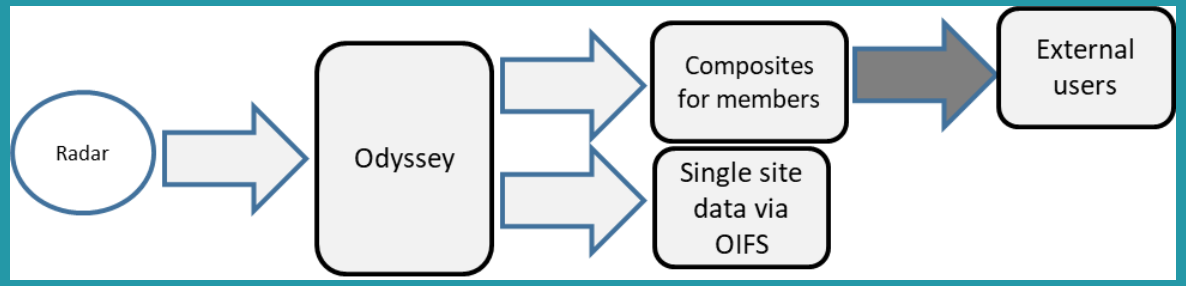
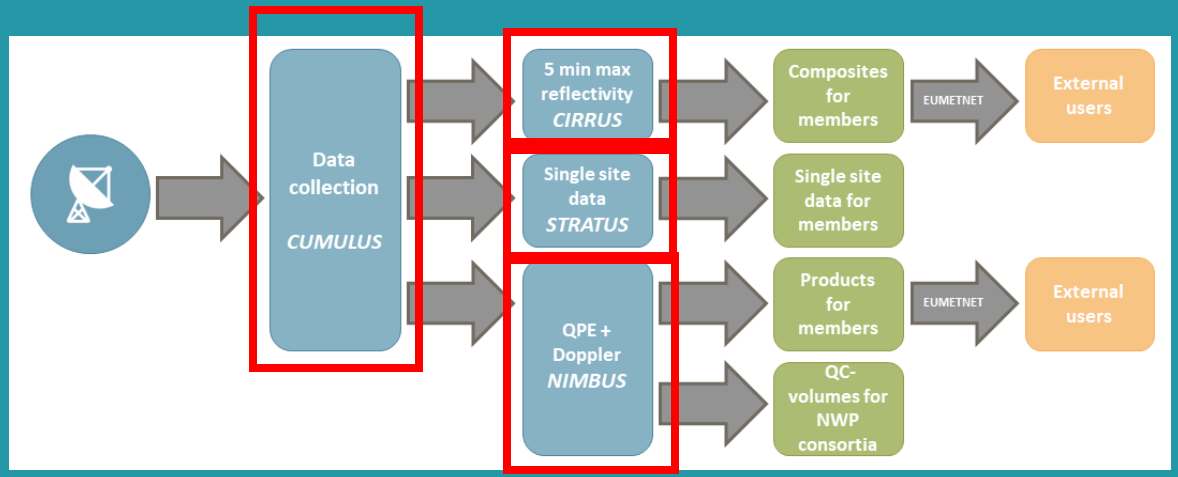
OPERA data production



- CIRRUS 5 – minute maximum reflectivity production line with 1 km spatial resolution
- NIMBUS for the quality-controlled precipitation composites, and wind profiles (2025) every 15 minutes, and the quality-controlled radar volumes for the NWP
- New production fully operational since Q2/24 > ODYSSEY shut down Q3/24

- ODYSSEY operational since 2011
- Same software run in two institutes for redundancy
- CUMULUS/STRATUS collecting volume radar data and transferring forward



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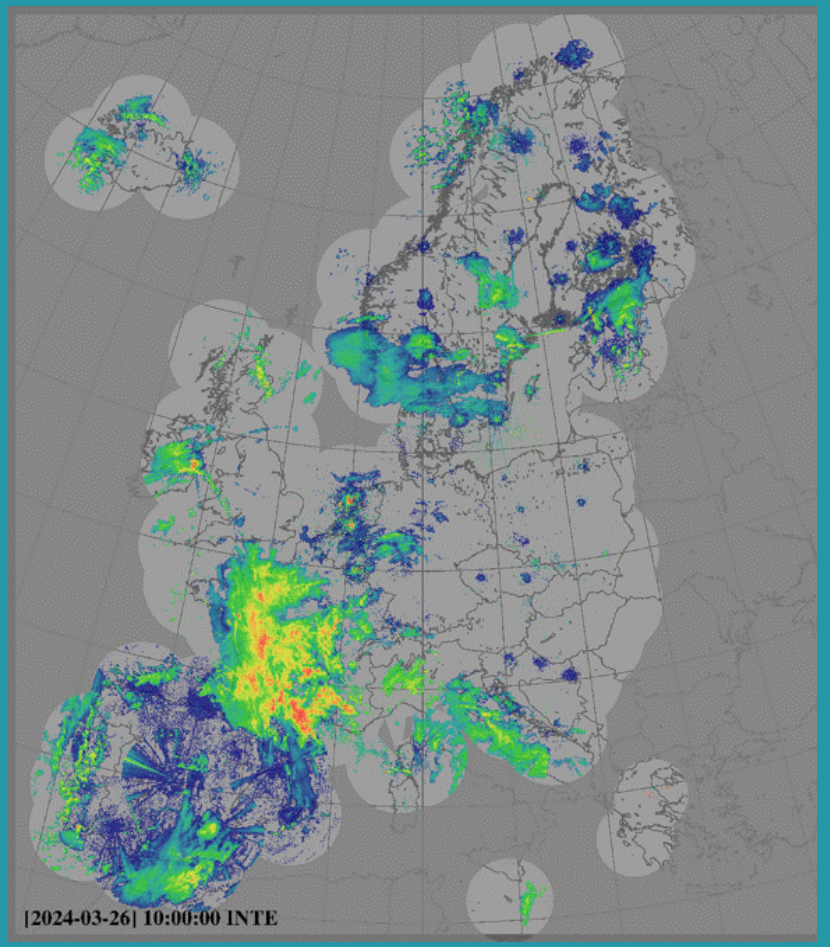
Huuskonen, A. et al. (2014). The Operational Weather Radar Network in Europe, BAMS, 95(6), 897-907.

OPERA data production

- Based on national observed polar scans and volumes
- Quality relies on quality, availability, and timeliness of the incoming data
- Centrally applied four filters (Saltikoff et al. 2019):
  - i) anomaly detection and removal algorithm
  - ii) hit-accumulation filtering algorithm
  - iii) correction of beam blockage
  - iv) satellite filtering of non-meteorological echoes
- Members select the filters applied to their data
- Total Quality Index is calculated from i), iii), and iv)



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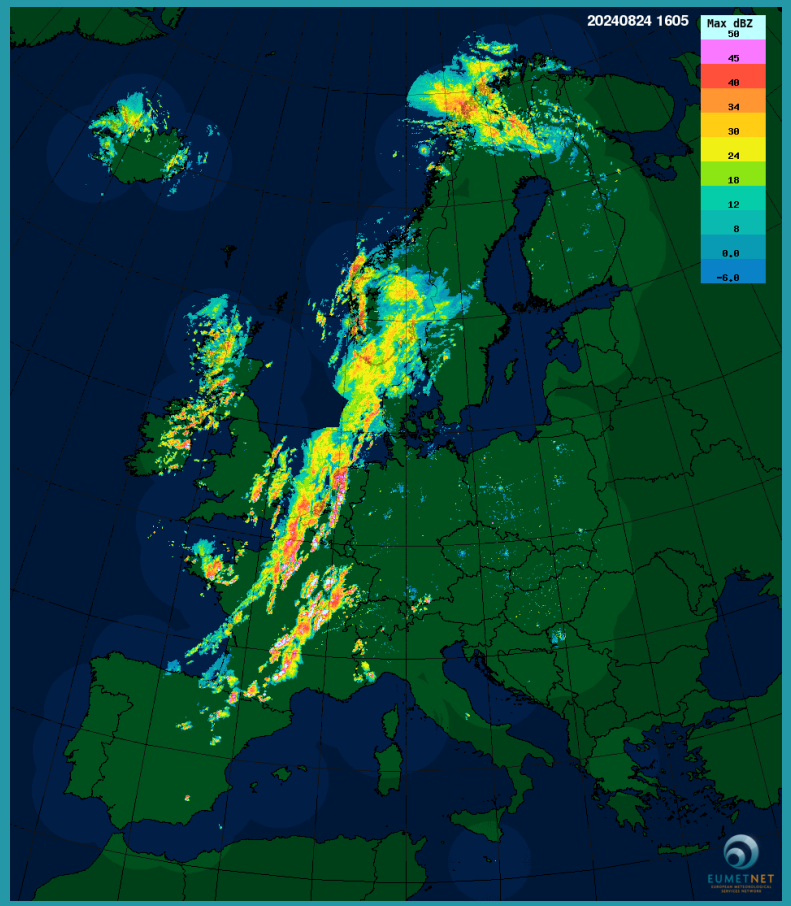
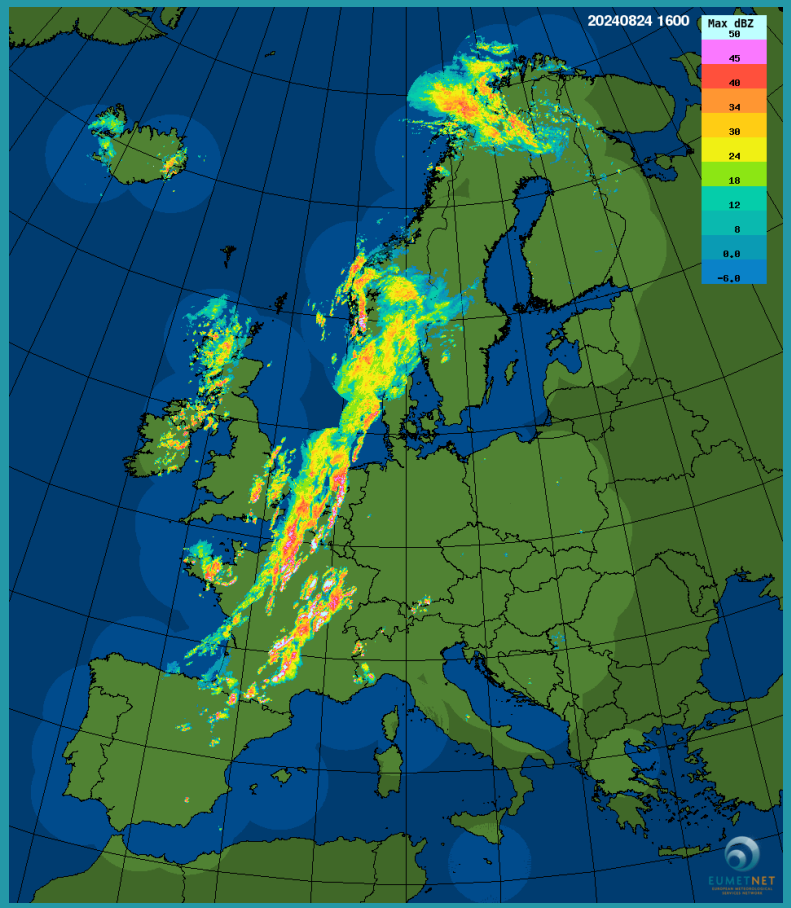
Saltikoff E, et al.. (2019). OPERA the Radar Project., Atmosphere, 10(6), 320.

CIRRUS Maximum reflectivity composite

CIRRUS



ODYSSEY



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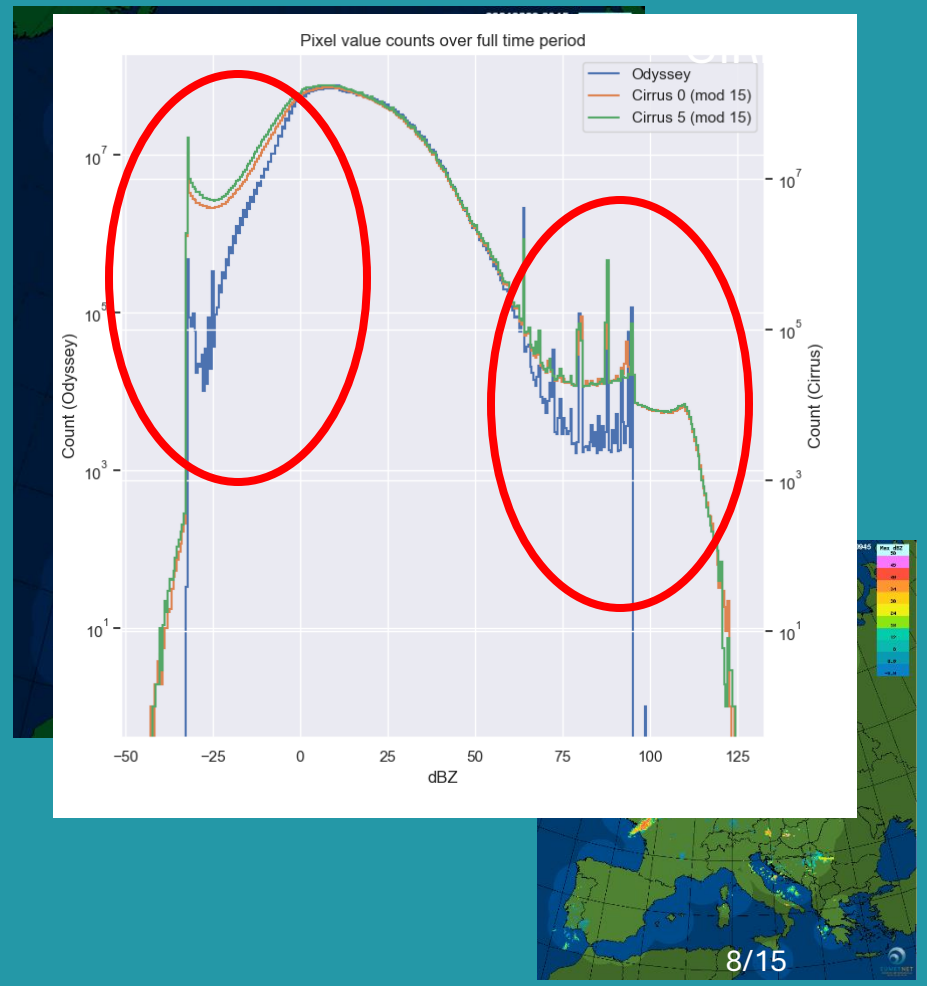
CIRRUS Maximum reflectivity composite

- Legacy on ODYSSEY software
- Currently, thresholding is advised to remove lower-noise clutter

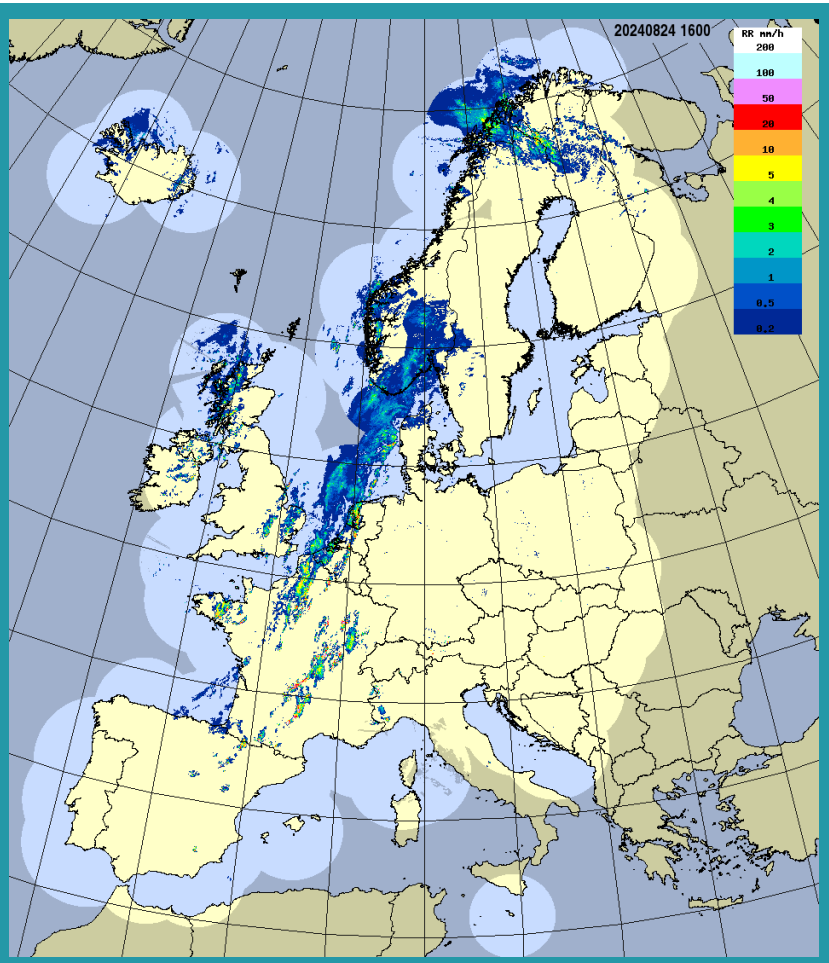
Product:
- Maximum reflectivity composite (MAX) with an improved horizontal gridding of 1 km every 5 minutes



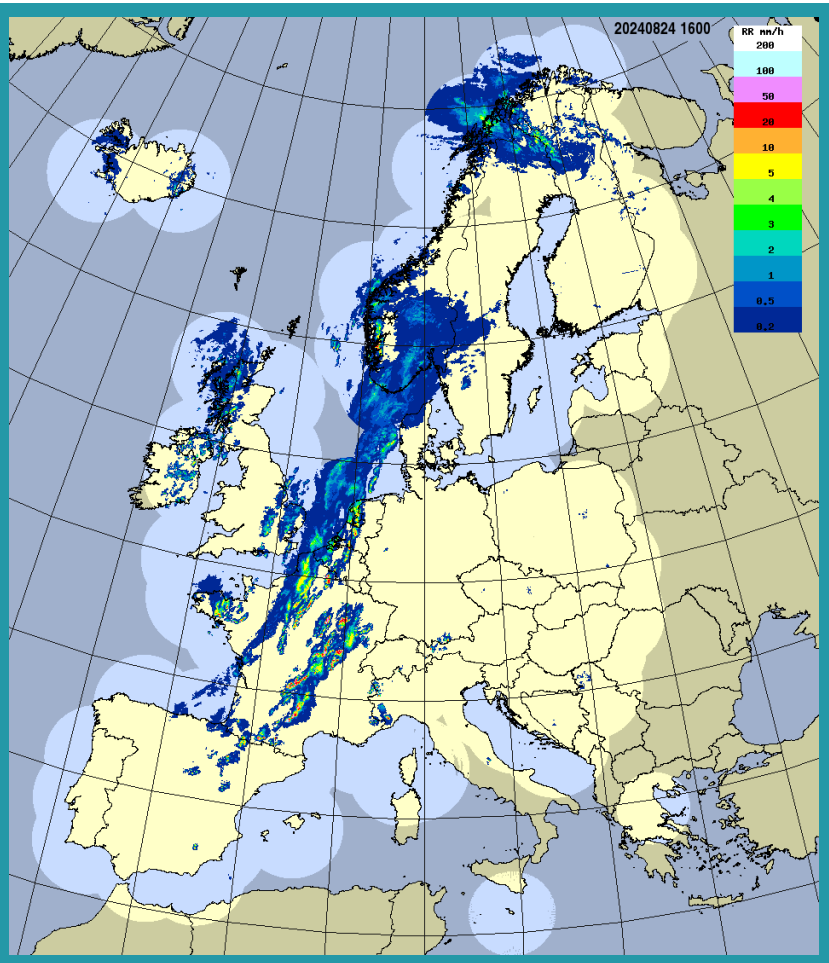
ODYSSEY

NIMBUS rain rate composite

NIMBUS



ODYSSEY



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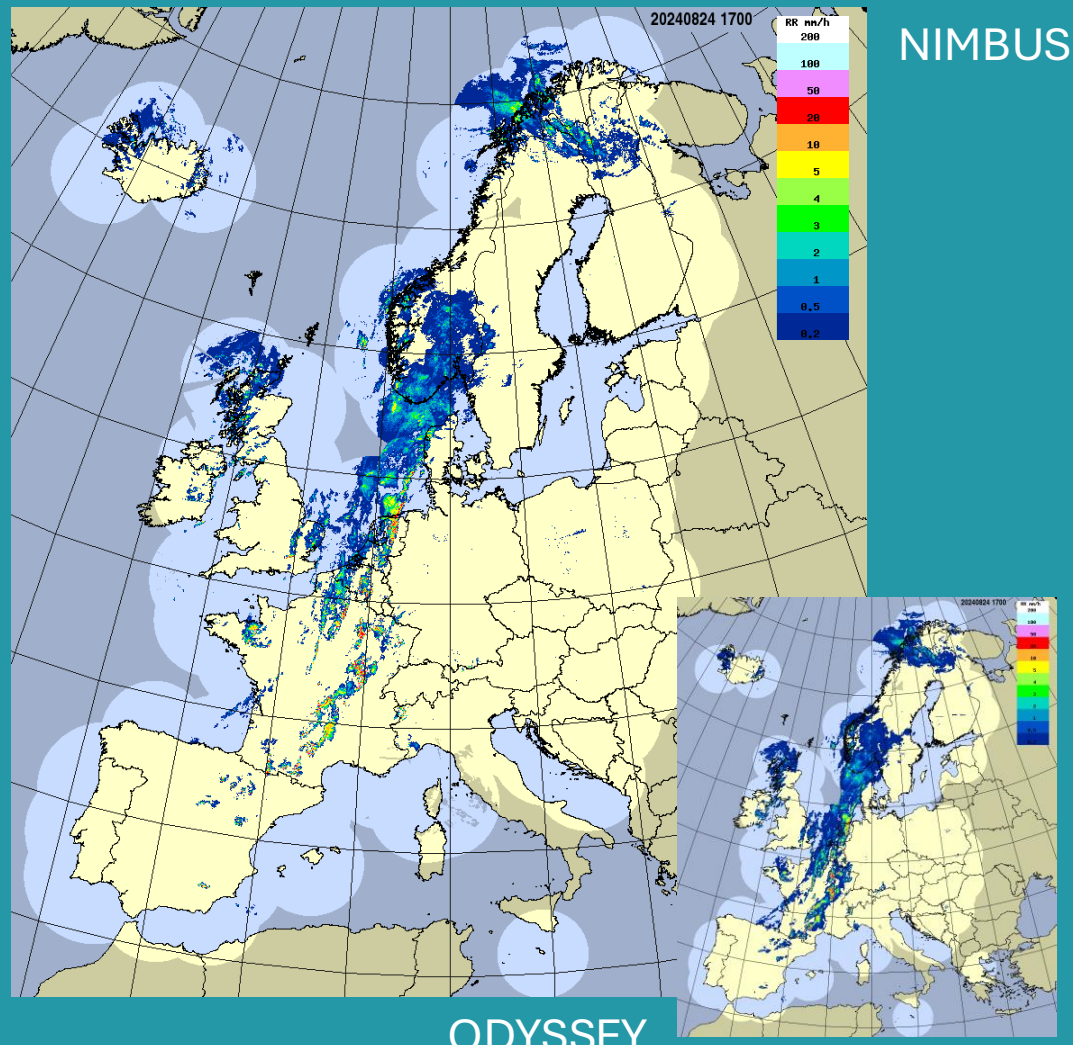
NIMBUS precipitation composites and QC volume data for NWP

- Based on the open source BALTRAD software
- Significant difference to ODYSSEY is the compositing algorithm

Products:

- Instantaneous rain rate (RR) and 1h - rain accumulation (ACC) composites with a horizontal resolution of 2 km every 15 minutes
- Quality-controlled volume data (every 5/15 minutes) for NWP
- Centrally processed wind profiles (2025)
- Runs monitoring algorithms (solar, RFI)



NIMBUS

ODYSSEY

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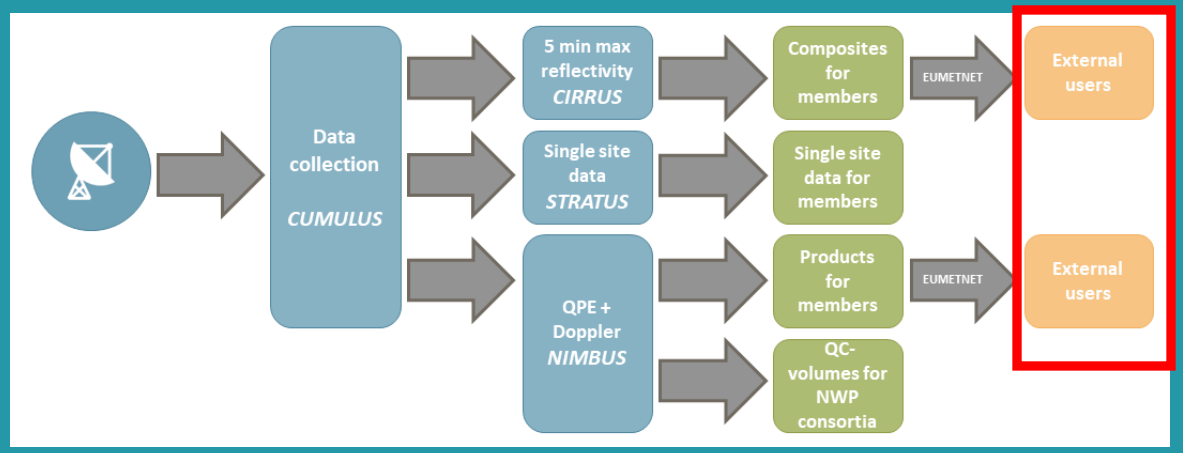
Supply of OPERA data and products

Co-funded by the European Union

- Currently the dissemination of OPERA products to external users is provided through the members with the EUMETNET licensing
- Open Data Directive (EU) 2019/1024: High Value Datasets (12/22)
- RODEO is a joint effort by 11 NMHSs, ECMWF, and EUMETNET
- Develops a user interface and Application Programming Interfaces (APIs) for accessing meteorological datasets declared as High Value Datasets (HVD)



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Supply of OPERA data and products

Co-funded by the European Union

- Open Radar Data (ORD) includes:
  - OPERA radar composites in real-time and an archive
  - Cache of 24-hour operational OPERA exchanged radar volume data
  - Extensive archive of OPERA radar volume data in Europe
  - Demonstration of national products

  - Testing in Q2-Q3/2025
  - Operational Q4/2025

Provision of Open Access to Public Meteorological Data and Development of Shared Federated Data Infrastructure for the Development of Information Products and Services

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Summary

- OPERA is the operational weather radar programme of EUMETNET
  - Responsible for radar data exchange in Europe between national met services
  - Operational supply of composite products and volume data for NWP community

- The production line ODYSSEY replaced by CUMULUS/STRATUS, CIRRUS and NIMBUS in Q2/2024
- Currently products are available for end-users through OPERA members and EUMETNET licensing, but in 2025 OPERA data and products should be freely and openly available via ORD API developed in RODEO-project

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More info:

- https://www.eumetnet.eu/activities/observations-programme/current-activities/opera/
- https://rodeo-project.eu

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