

OPERA – Harmonizing the European Weather Radar Network

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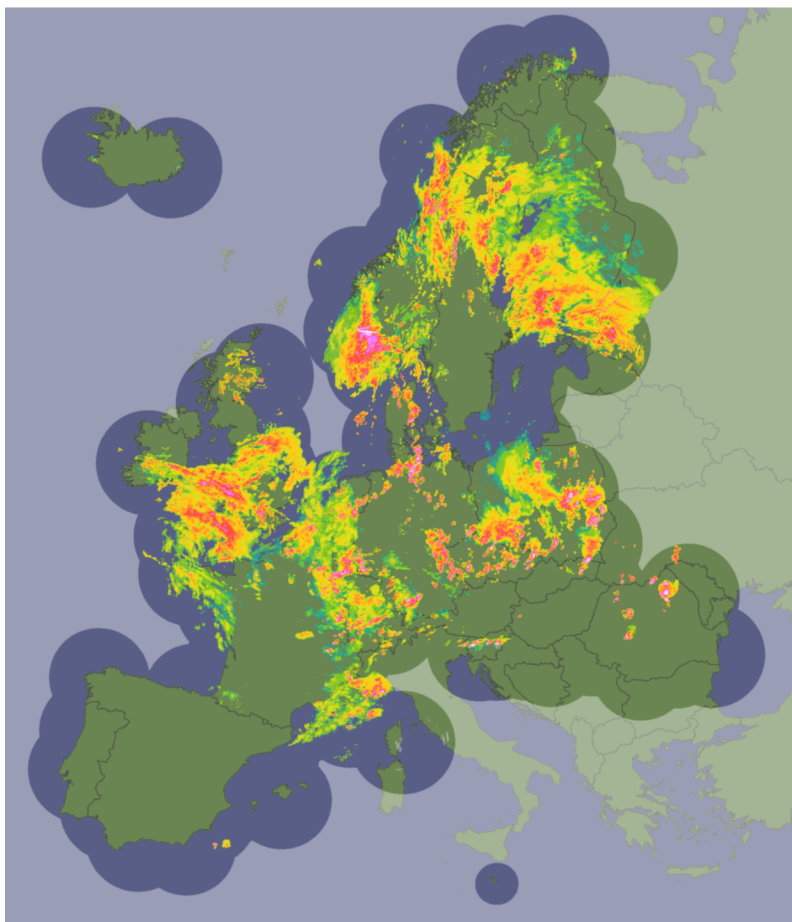
The Network of European Meteorological Services, EUMETNET, initiated the Operational Programme for the Exchange of Weather Radar Information (OPERA) in the 1990's to promote exchange of measurement data and knowledge. Since then, progress has been made in harmonization of hardware, measurements and file formats. The network-wide radar mosaic produced operationally since 2011 demonstrates progress of the harmonization efforts. The current programme phase, OPERA 4, covers years 2013-2018.

Cooperation

- Exchange of data, information and knowledge
- About 200 weather radars, over European 30 countries – the network is heterogeneous in hardware, signal processing, and scanning strategy
- Centralized radar image compositing at OPERA Data Centre
- Main application of volume data: numerical weather prediction
- Documentation of best practices in radar siting, operation and data production
- Recommendations for frequency protection and mitigation of wind farm interference
- Development and maintenance of common data format, ODIM (OPERA Data Information Model)
- Development environment for common development of processing software

Compositing

By creating a composite image (mosaic) of the European radars forecasters are able to track synoptic systems, cold and warm fronts. The European composite is founded on a very dense network of radars; the mean distance between radars is 126 km (80 miles). Hence, measurements often overlap and measure the same rain element with different radar which allows a better knowledge of cloud properties.



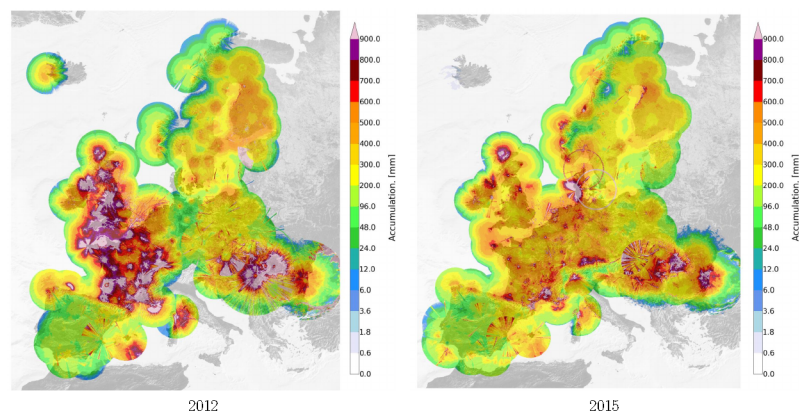
European composite (rainfall rate) at 12:00 UTC on 2017/07/11.

A recent OPERA study involved computing long-time accumulations of the European composite, revealing processing discrepancies and quality problems in data, but also improvement in overall quality after introduction of quality control procedures.

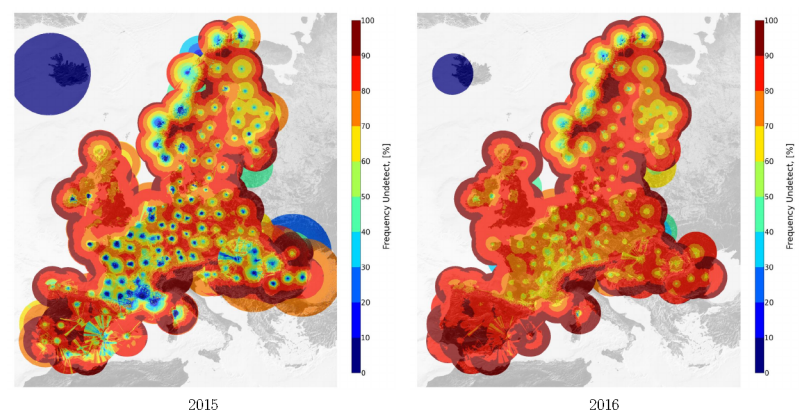
The processing for generating the composite has changed in December 2015 in order to improve the removal of non-meteorological signals and to correct for beam blockage. The three following treatments have been incorporated:

- Removal of non-meteorological echoes (based on radar data analysis)
- Clutter filtering (based on satellite observations)
- Beam blockage correction

In OPERA 4, a quality-based compositing is under development, and is expected to yield European rainfall products with improved quality, with information about the local quality.



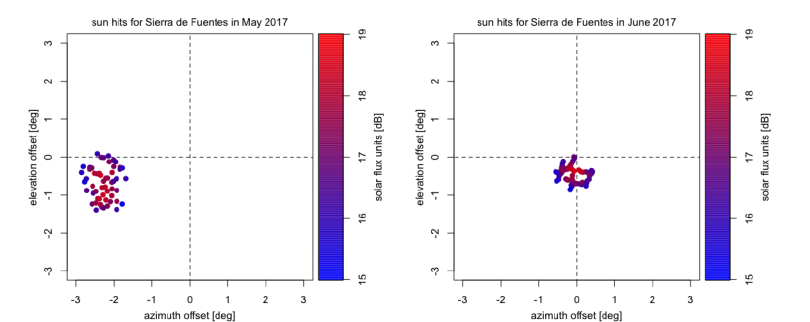
Comparing rainfall of 2012 and 2015 shows improvement in network harmonization.



Percentage of 'undetected' pixels has decreased near the radars, indicating successful clutter suppression.

Algorithm development

OPERA has involved work on testing and evaluating the algorithms developed by the members. The idea is to test these algorithms in a central environment using data from across Europe, i.e. from radars of varying characteristics and settings (wavelength, scan schedule, etc.) and physical environment (climate, terrain, proximity to sea, etc.). This will yield information about the robustness and general applicability of the algorithms, leading ultimately to developing new algorithms that incorporate the best parts of the various algorithms tested. Most of the development work has focused on quality control.



Example of benefits of OPERA solar monitoring service. Before (left) and after (right) adjustment of hardware.

Perspectives

During 2017-2018, OPERA will focus on improving Doppler quality, convection analysis, vertical profile correction, and best practices of monitoring and calibration. Special attention will be paid on generality of algorithms and code portability. The next OPERA stage 5, aimed for 2019 – 2023, is under planning in EUMETNET.

<http://eumetnet.eu/opera>

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