



4.1. Improving RainGRS+ precipitation estimates by combining different types of data in a more efficient and seamless manner

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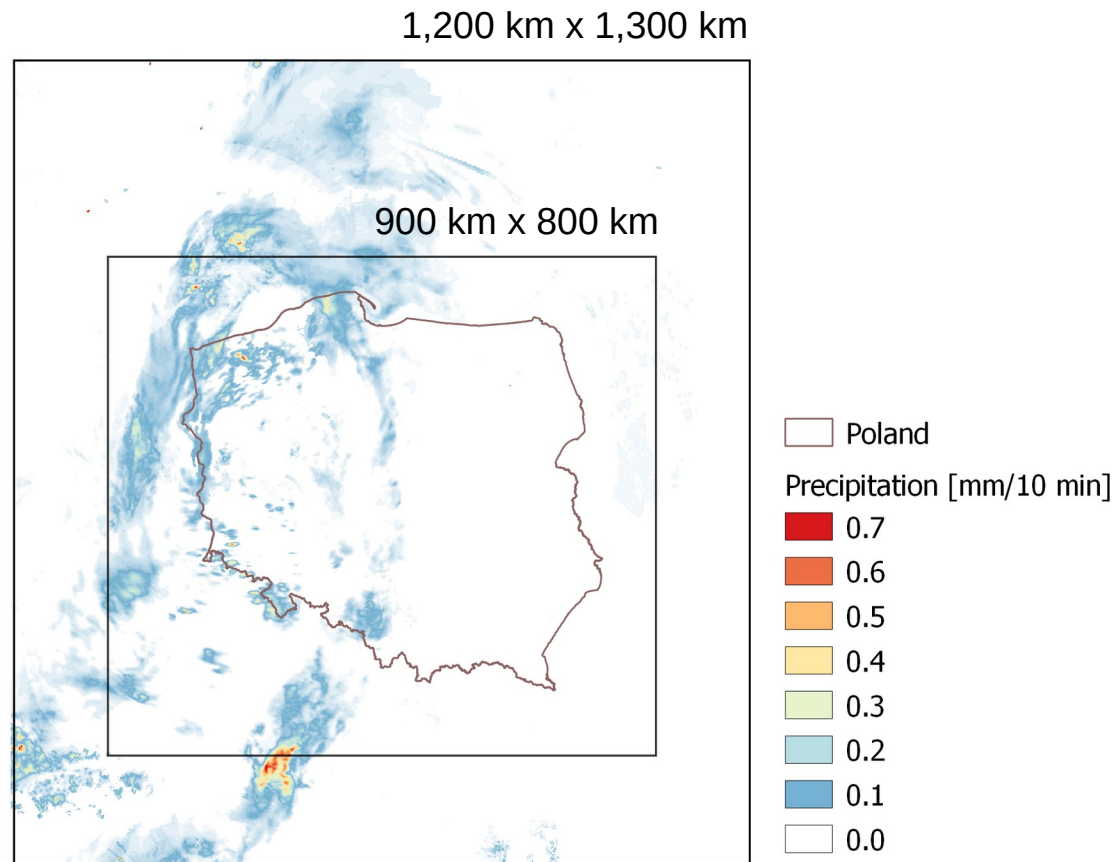
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RainGRS (internal) and RainGRS+ (external) domains





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RainGRS+ combines data from rain gauges, radars and satellites. The work was focused on merging radar data from:

- POLRAD – a network of 10 Polish IMGW radars supplemented by 10 radars from neighbouring countries,
- the European EUMETNET OPERA composite radar map.

Methodology: analysis of the quality index (QI) for both individual measurement techniques and specific devices/sensors.

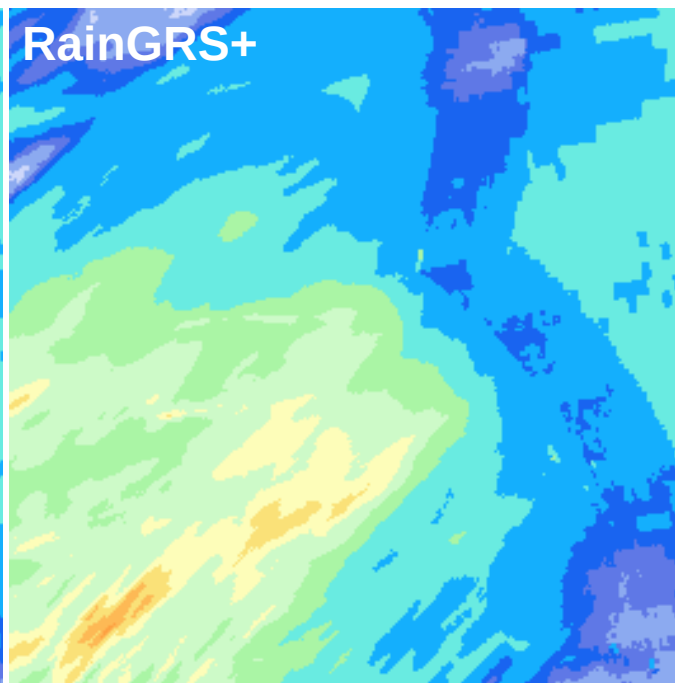
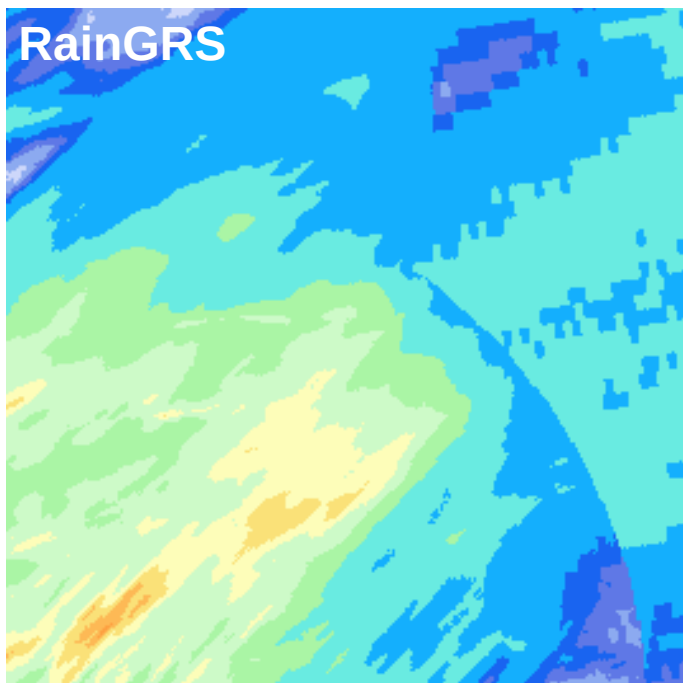
These two sources of radar data differ in resolution, range and correction effectiveness (POLRAD data is of significantly higher quality):

Source	Spatial resolution	Temporal resolution	Radar range	Tool for quality control
POLRAD	1 km	5 min	up to 215 km	RADVOL-QC
EUMETNET OPERA: NIMBUS	2 km	15 min	up to 250 km	BALTRAD toolbox



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Excerpt (270 km x 270 km: eastern border of Poland) from the RainGRS and RainGRS+ domains.

Daily precipitation, June 30, 2025.

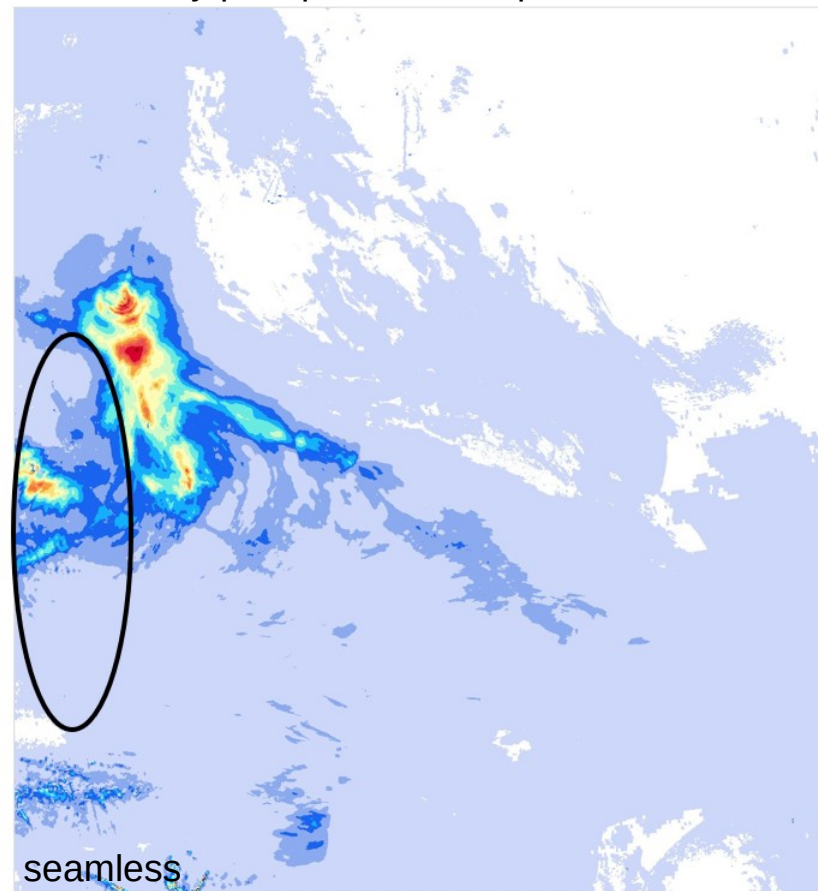
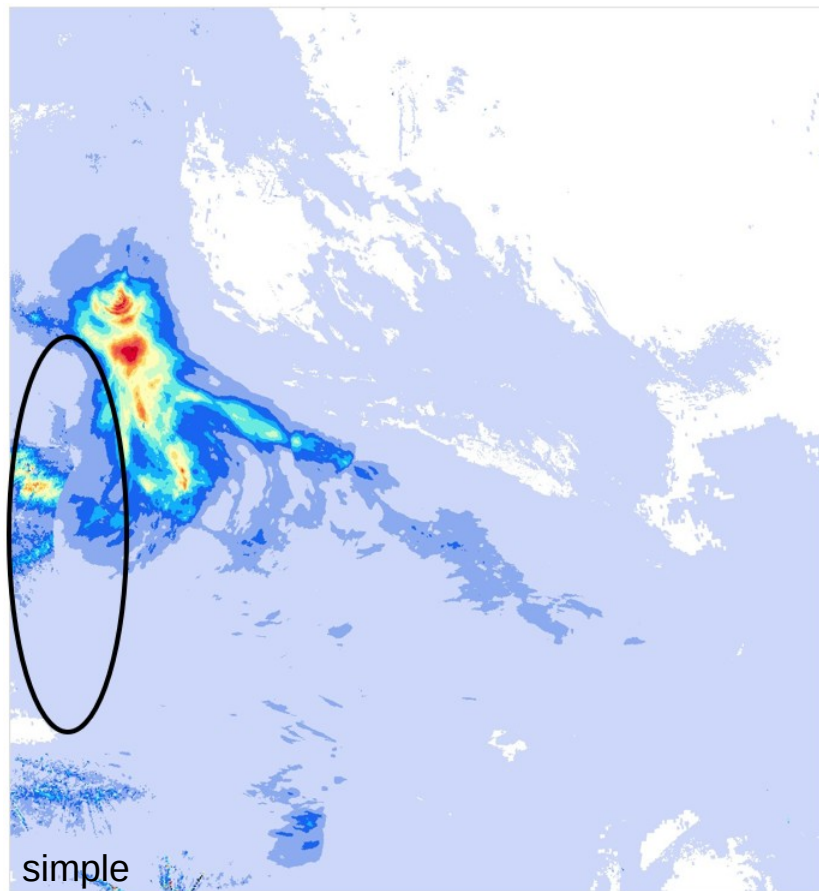
The main problem is smoothly combining radar and rain gauge data with satellite data at the boundary of the RainGRS+ domain, where satellite data is the only precipitation information available further east. Unfortunately, Meteosat-based estimates are considerably less reliable.



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Daily precipitation: 20 April 2026, 06 UTC



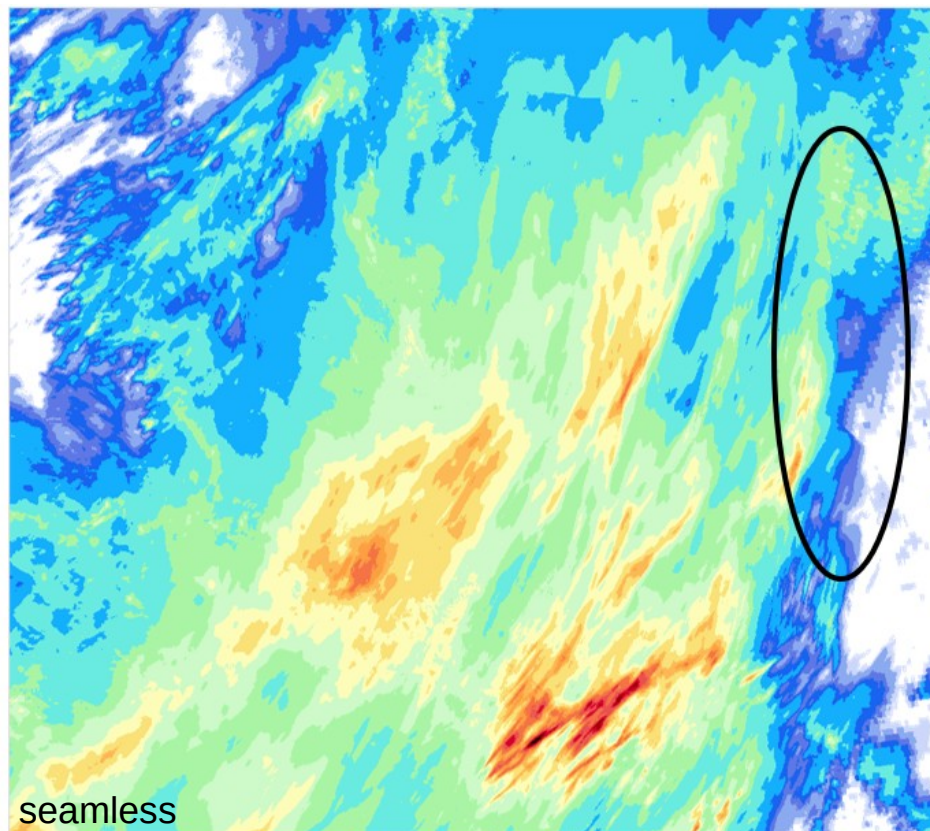
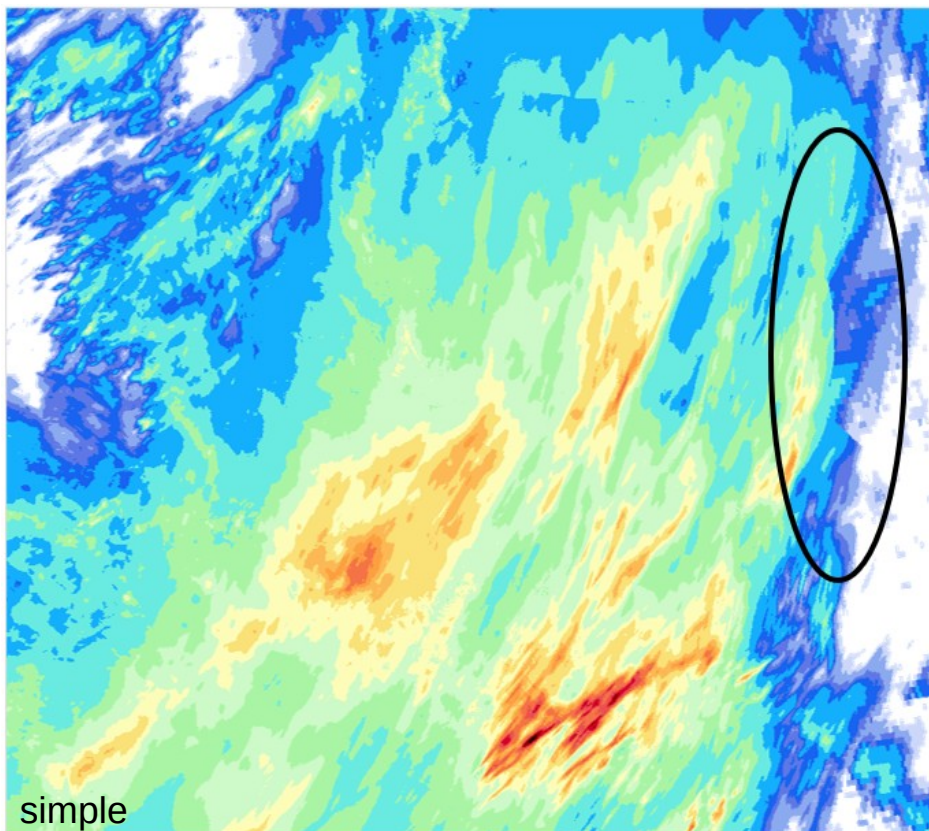
Merging OPERA and POLRAD radar data: minimising the impact of differences in radar range between these networks and ensuring a seamless transition between the data.



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Daily precipitation: 11 June 2026, 06 UTC



Seamless transition between areas where only satellite data is available and radar and satellite data are merged.



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Status of adding new opportunistic data

- Thanks to the launch of the IMGW-PIB network of private weather station (PWS), data from over 50 stations in Poland will soon be available, but more importantly, we will also gain access to data from PWS stations located in neighbouring countries ([Task 1](#)).
- At the same time, work is underway on estimating the precipitation field from CML data ([Subtask 2.1](#)), and once this is complete, work will begin on incorporating it into RainGRS+.



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Status of work

RainGRS+ combines data from rain gauges, radars (OPERA and POLRAD), and satellites. Work on seamlessly merging all the data has been completed:

1. Development of an algorithm for merging OPERA and POLRAD radar data with the aim of: (a) minimising the impact of differences in radar range between these networks, (b) ensuring a seamless transition between OPERA and POLRAD data.
2. Development of an algorithm for seamless transition between areas where: (a) only satellite data is available, (b) radar and satellite data are merged.

Thank you!



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