EGU24-16956

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Improving the resolution of satellite precipitation products in Europe

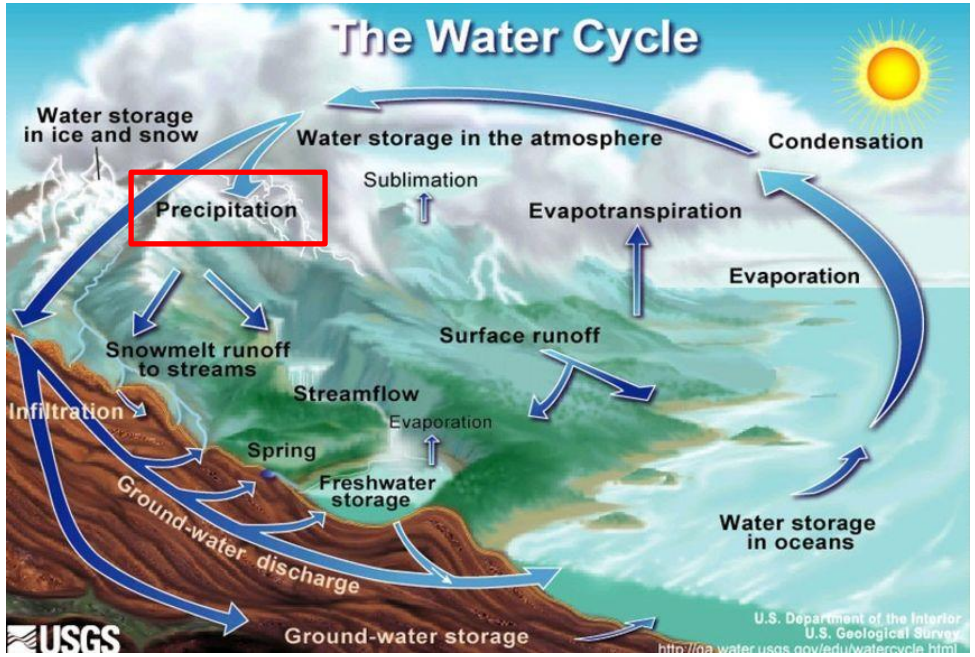
Presenter: Paolo Filippucci

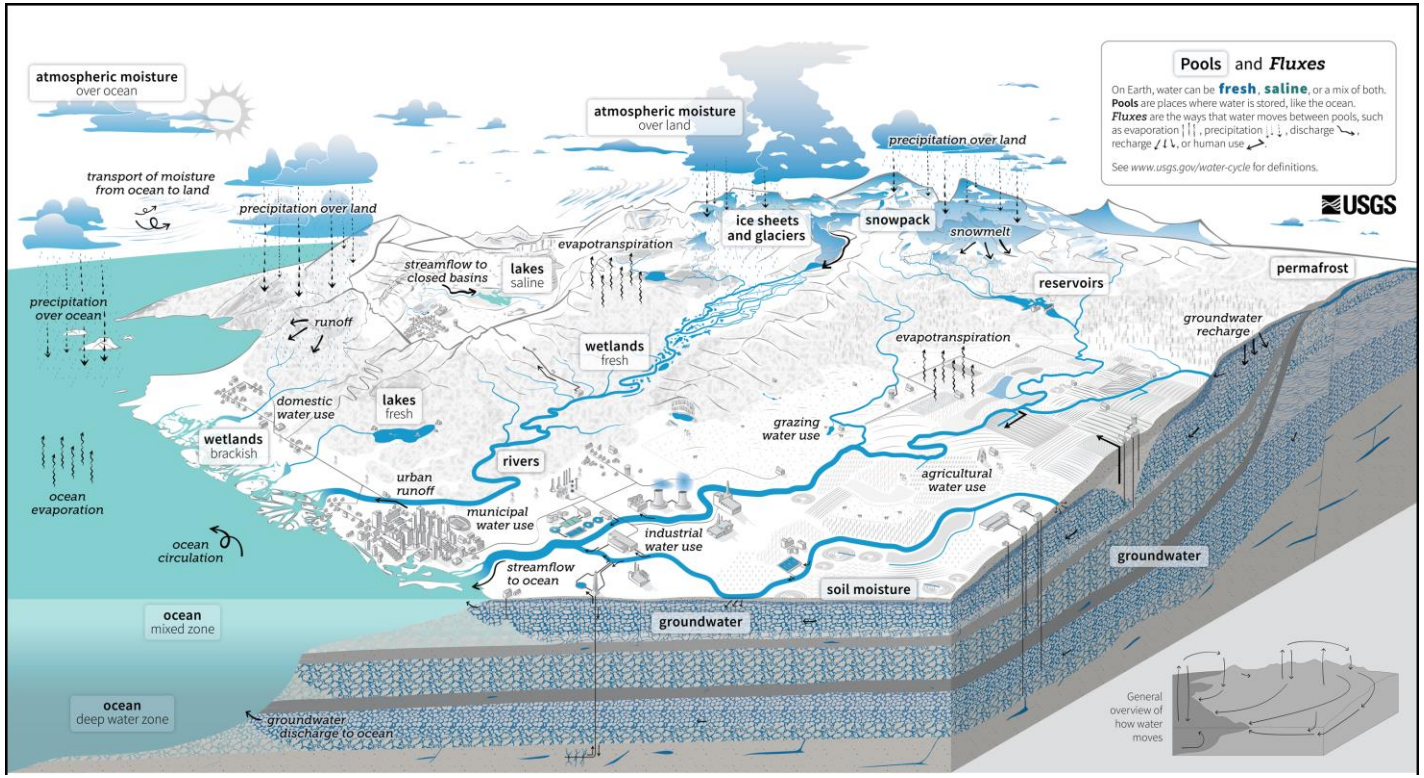
Team: Luca Ciabatta, Hamidreza Mosaffa, Christian Massari, Luca Brocca

National Research Council, Research Institute for Geo-Hydrological Protection, Perugia, Italy

4DHYDRO PROJECT:

HYPER-RESOLUTION EARTH OBSERVATIONS AND LAND-SURFACE MODELING FOR A BETTER UNDESTANGING OF THE WATER CYCLE





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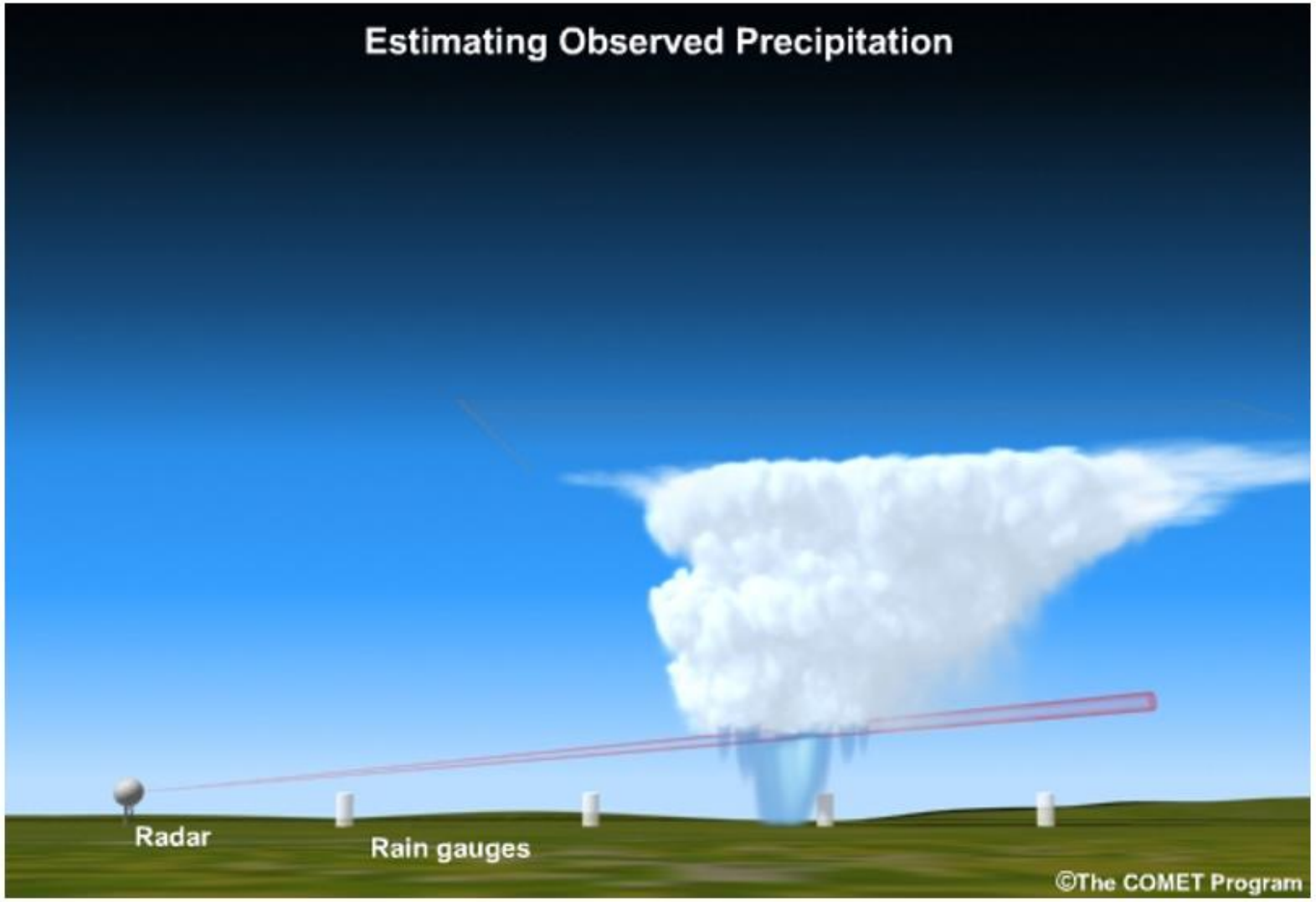
REMOTE SENSING OF PRECIPITATION



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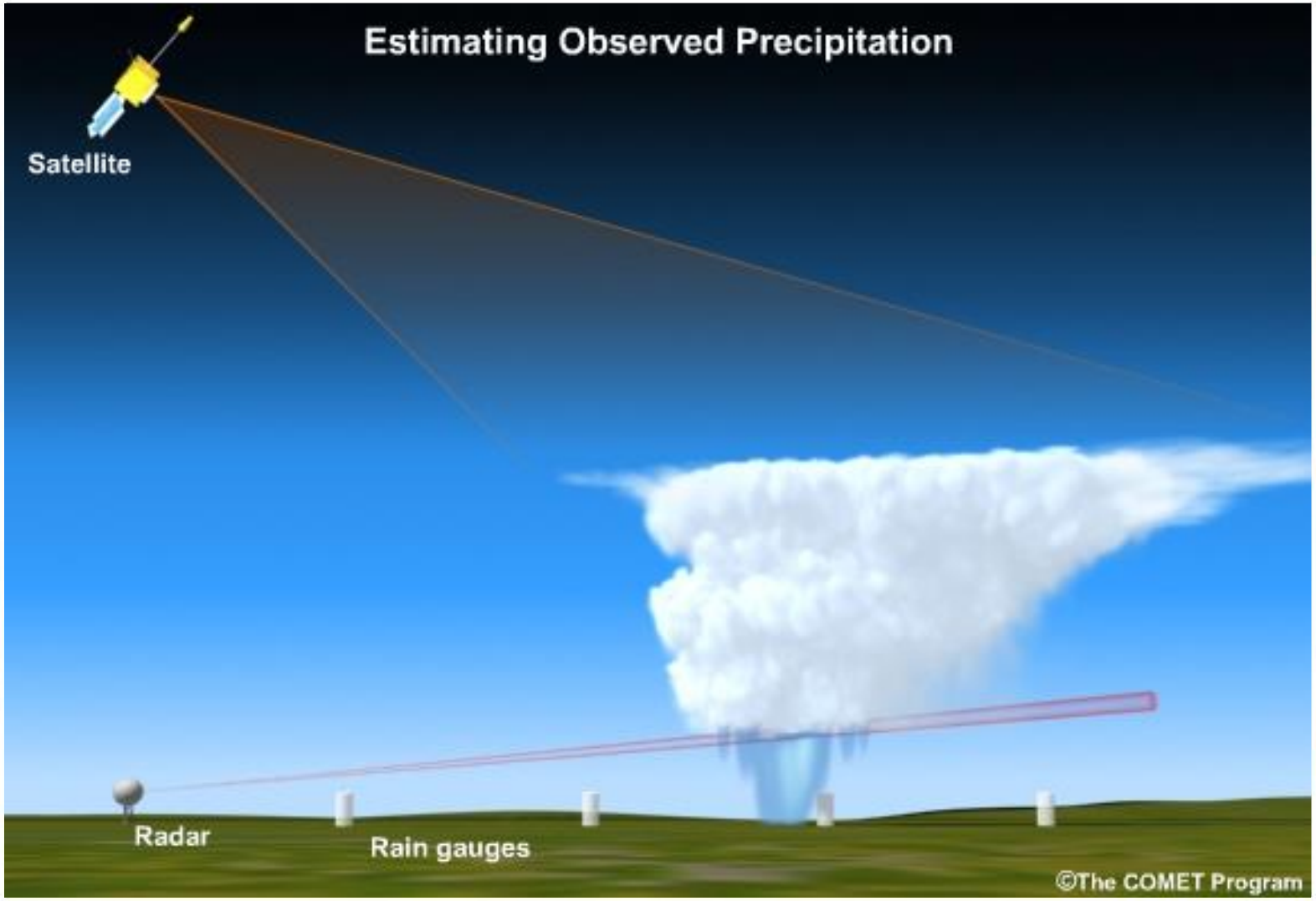

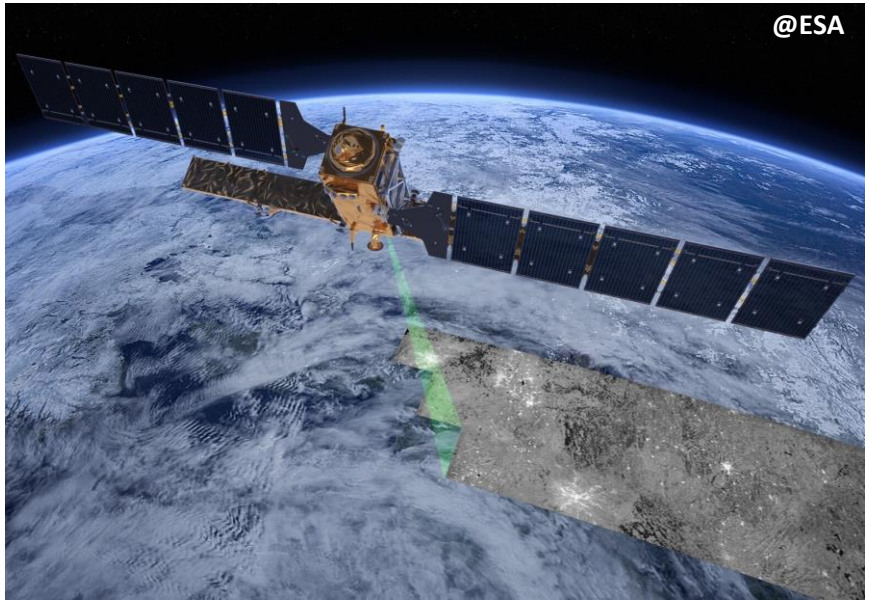

"bottom-up"approach based on SM2RAIN complementary to the classical "top-down" techniques

INTEGRATED PRECIPITATION PRODUCTS – WORK FLOW

Precipitation datasets	Spatial sampling	Period	Spatial coverage	Source
PERSIANN	0.04°	2003-2022	Lat: -60:60	Satellite TD
CHIRP	0.05°	1981-2022	Lat: -50:50	Satellite TD
GSMAP	0.10°	2000-2022	World	Satellite TD
GPM Late Run	0.10°	2000-2022	World	Satellite TD
SM2RAIN ASCAT	12.5 km	2007-2022	World	Satellite BU
Merged dw GPM-SM2A	1 km	2007-2022	World	Satellite BU+TD
Merged dw ERA5-GPM-SM2A	1 km	2007-2022	World	Satellite BU+TD+reanalysis
4DMED	1 km	2015-2022	Mediterranean basin	Satellite BU+TD+gauge

Benchmark	Spatial sampling	Period	Spatial coverage	Source
ERA5 Land	0.10°	1950-2022	World	Reanalysis
EOBS	0.10°	1950-2022	Europe	Gauge
EMO	1 arcmin	1990-2022	Europe	Gauge+reanalysis
MCM	1 km	2012-2021	Po basin	Gauge+radar
INCA	1 km	2016-2018	Austria	Gauge+radar
SAIH	1 km	1987-2022	Ebro basin	Gauge
COMEPHORE	1 km	1997-2021	Herault basin	Reanalysis (gauge+radar)

Analysis of multiple satellite precipitation datasets against high and coarse resolution benchmark datasets

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Analysis of multiple satellite precipitation datasets against high and coarse resolution benchmark datasets

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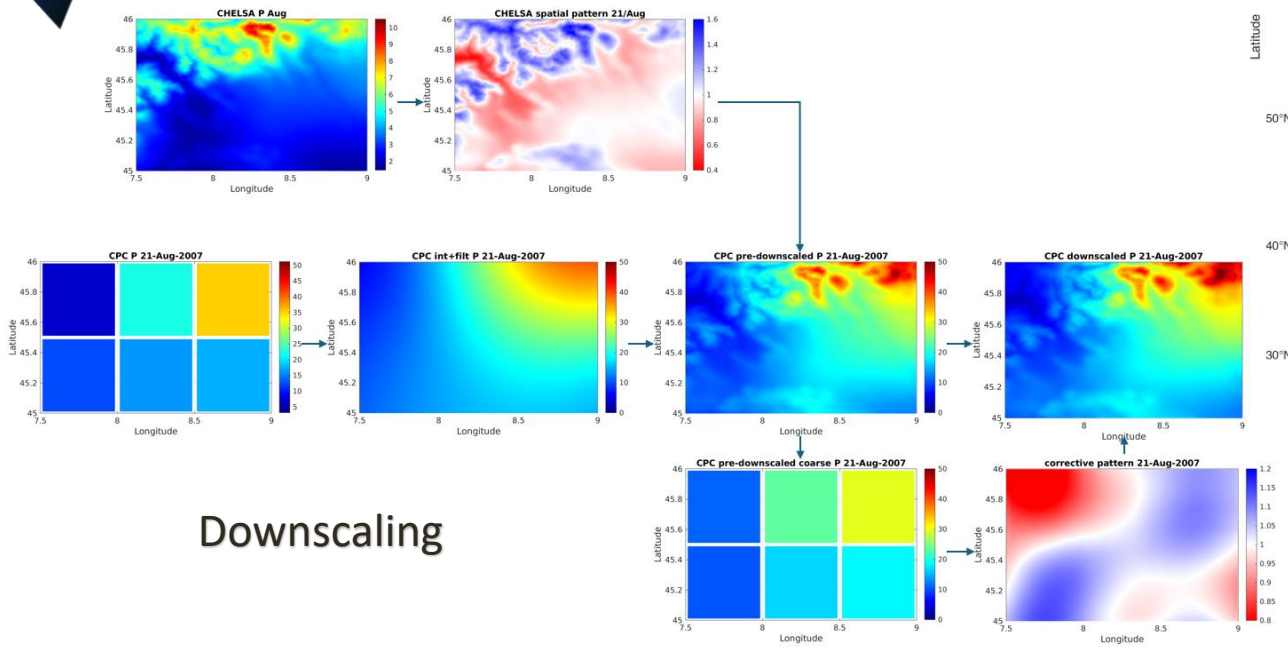
INTEGRATED PRECIPITATION PRODUCTS – WORK FLOW

Precipitation products collection
(low latency)

GPM Late-Run

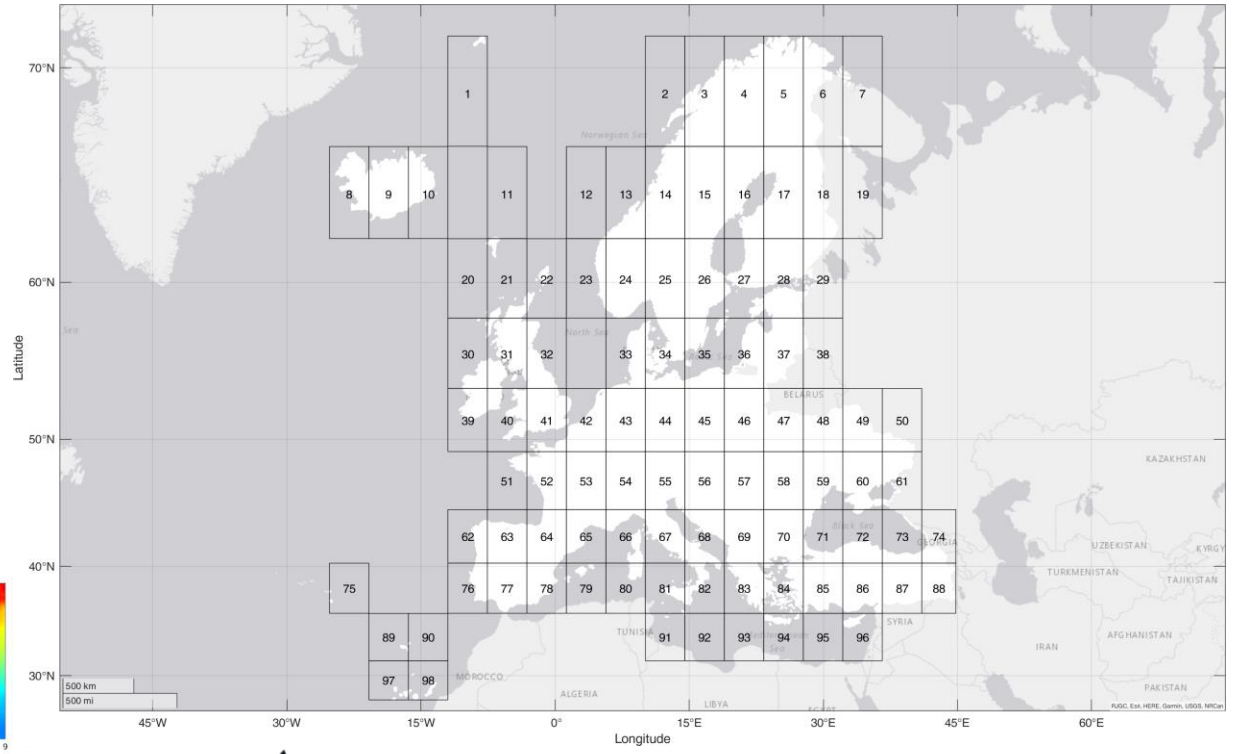
SM2RAIN-ASCAT

ERA5



Downscaling

Merging with triple collocation



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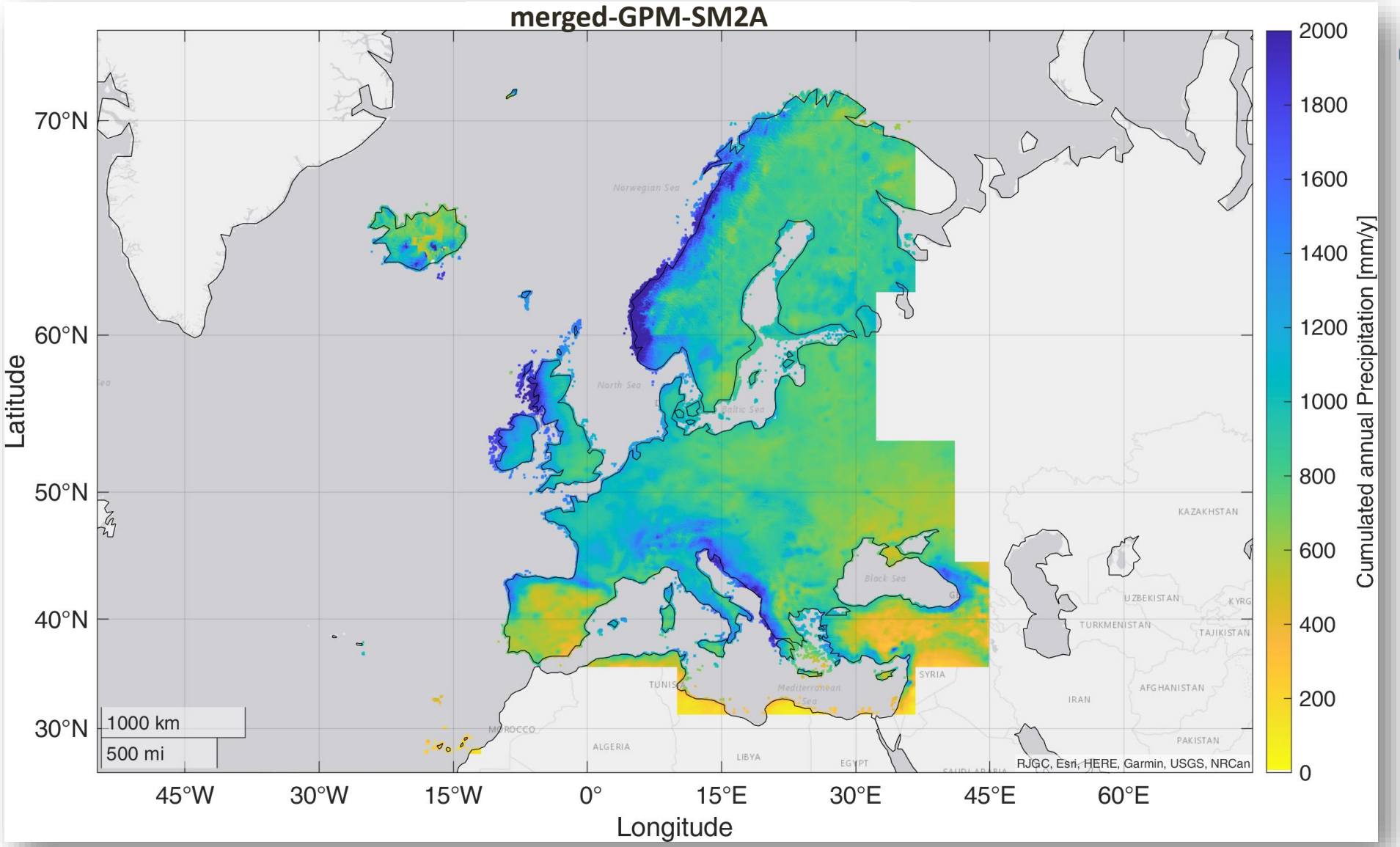
INTEGRATED RAINFALL PRODUCTS – MERGED PRODUCTS



Annual Precipitation

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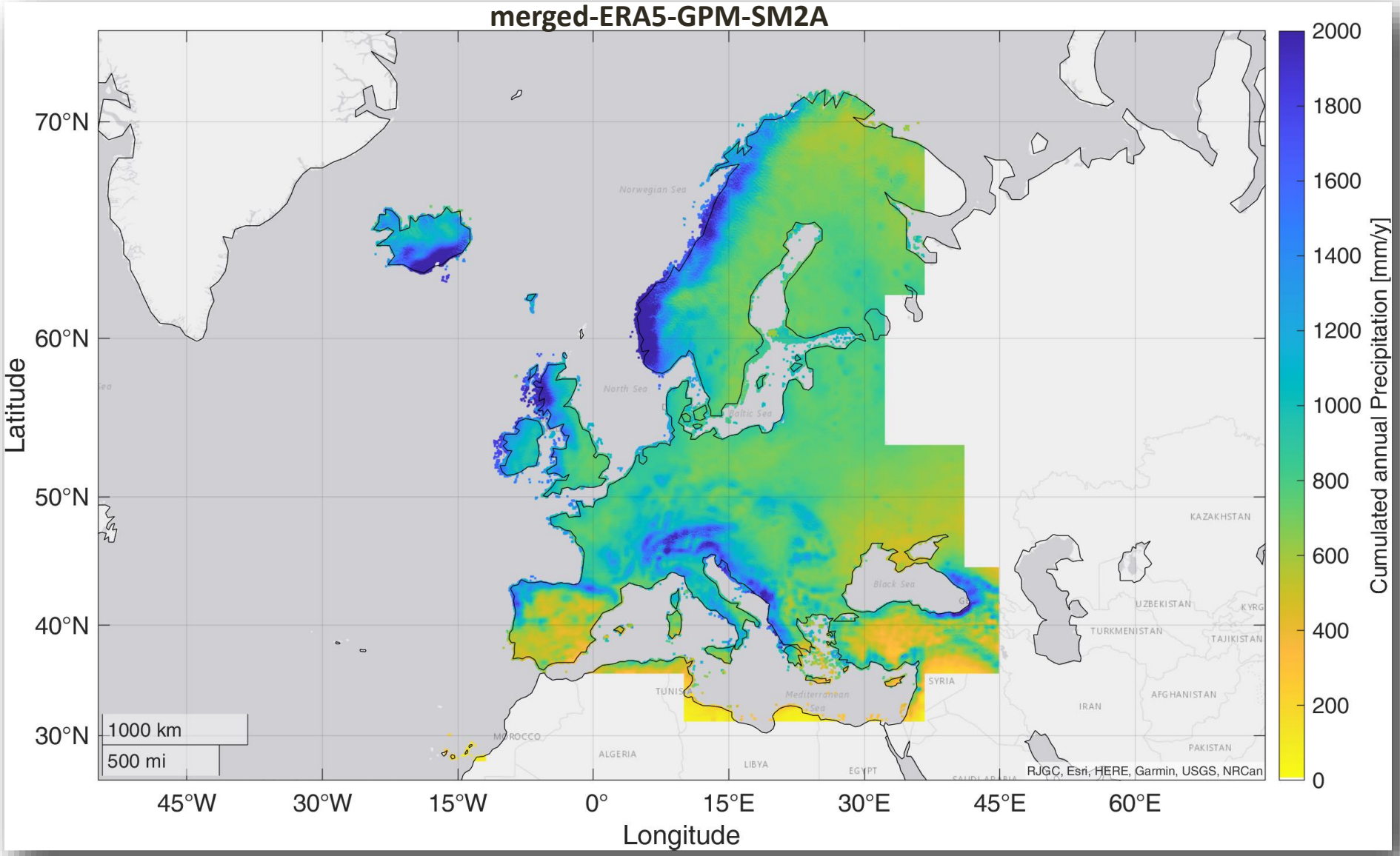
INTEGRATED RAINFALL PRODUCTS – MERGED PRODUCTS



Annual Precipitation

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INTEGRATED PRECIPITATION PRODUCTS – HR RESULTS

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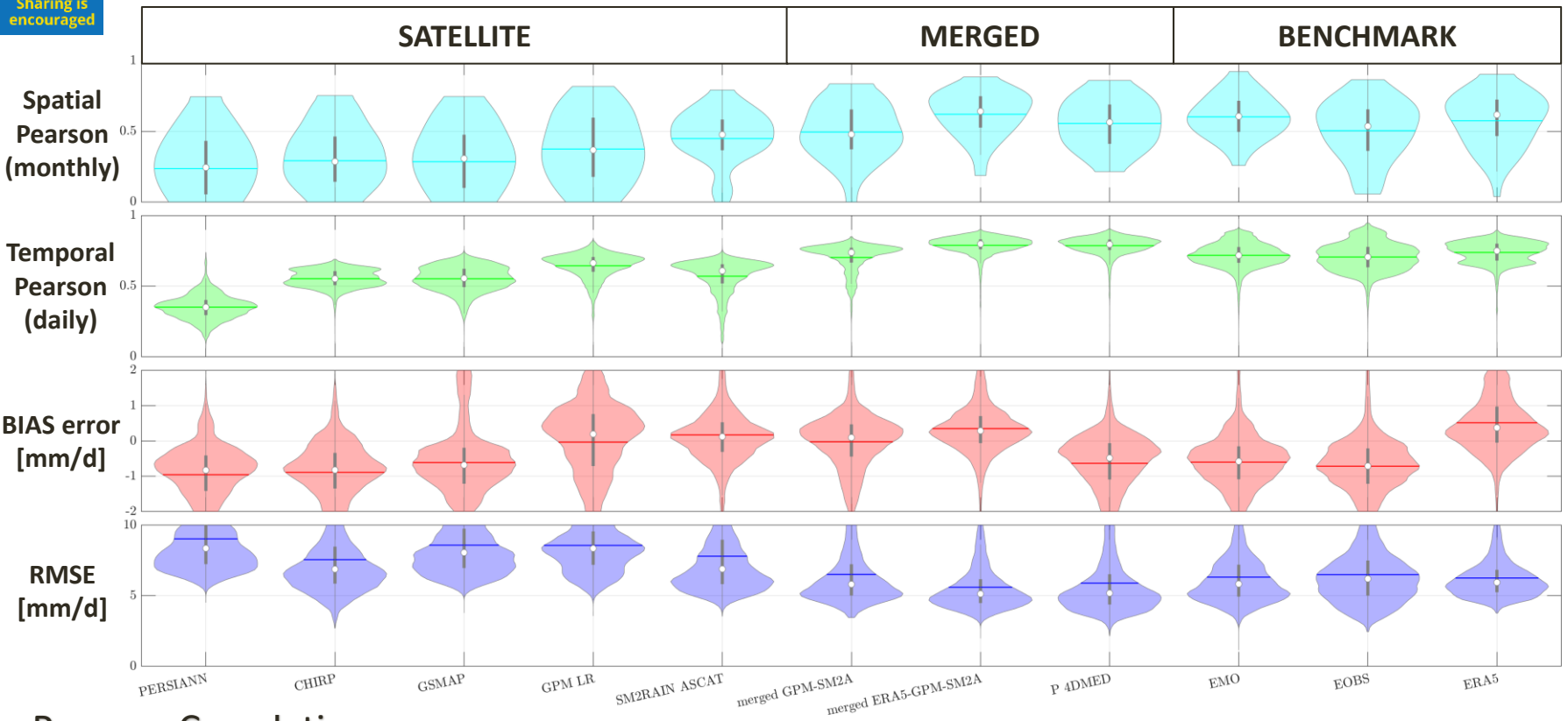
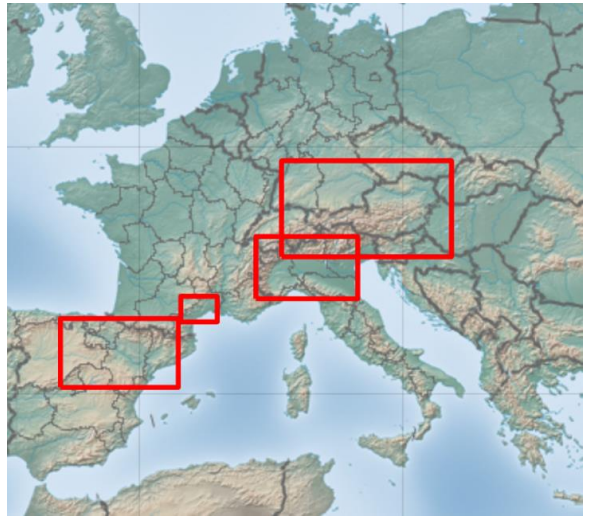
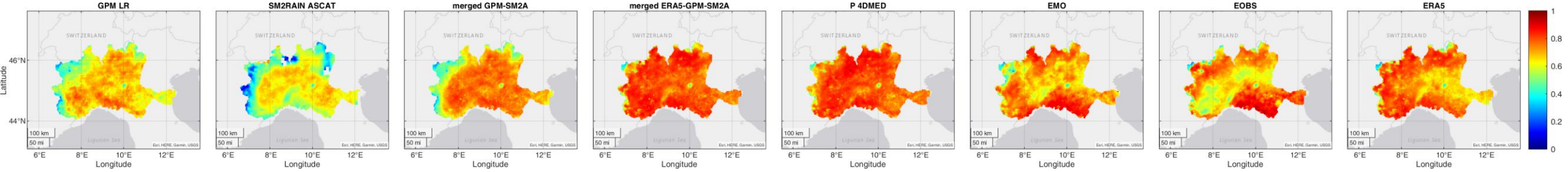


Po river basin



Pearson Correlation



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INTEGRATED PRECIPITATION PRODUCTS – HR RESULTS

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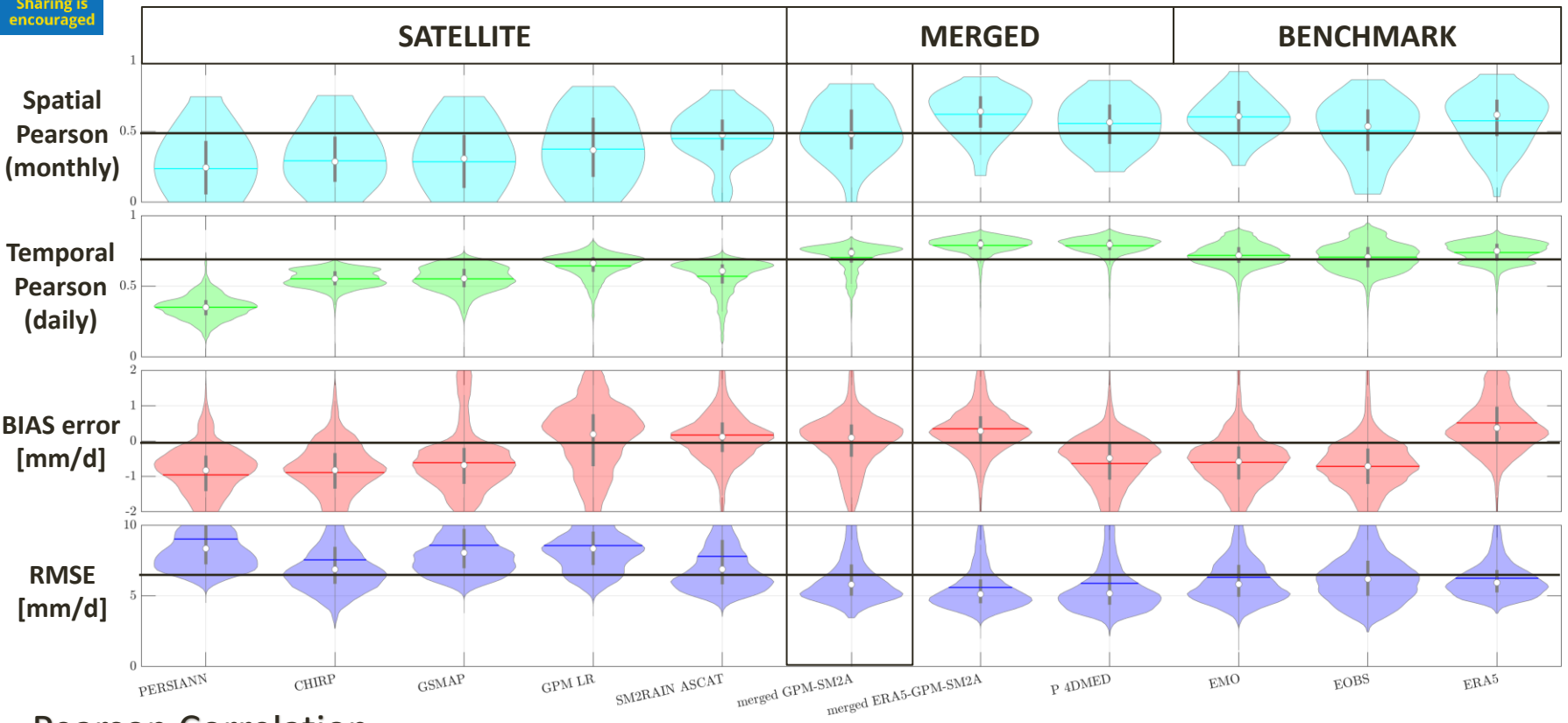

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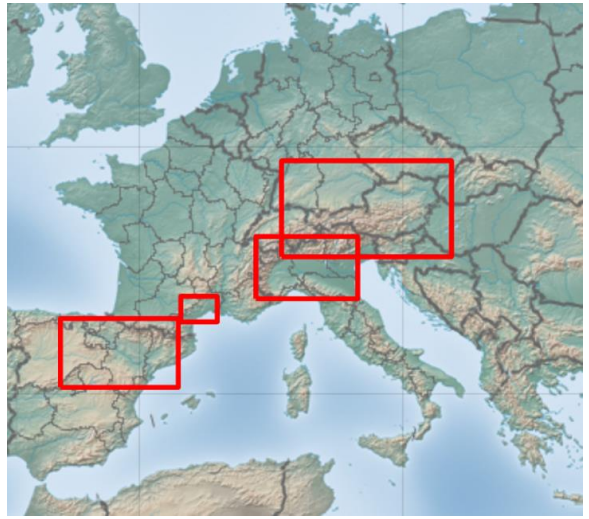

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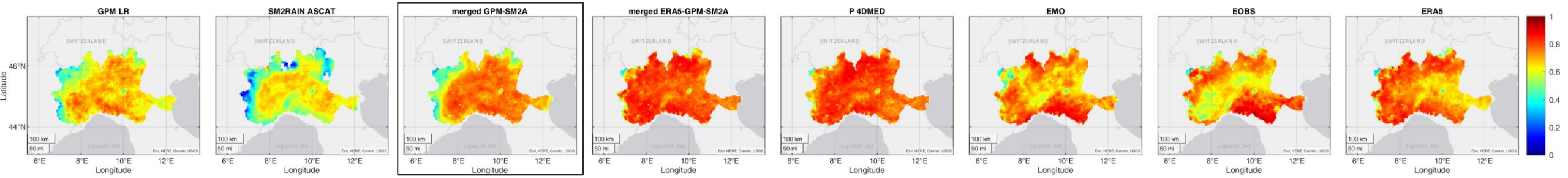

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INTEGRATED PRECIPITATION PRODUCTS – HR RESULTS

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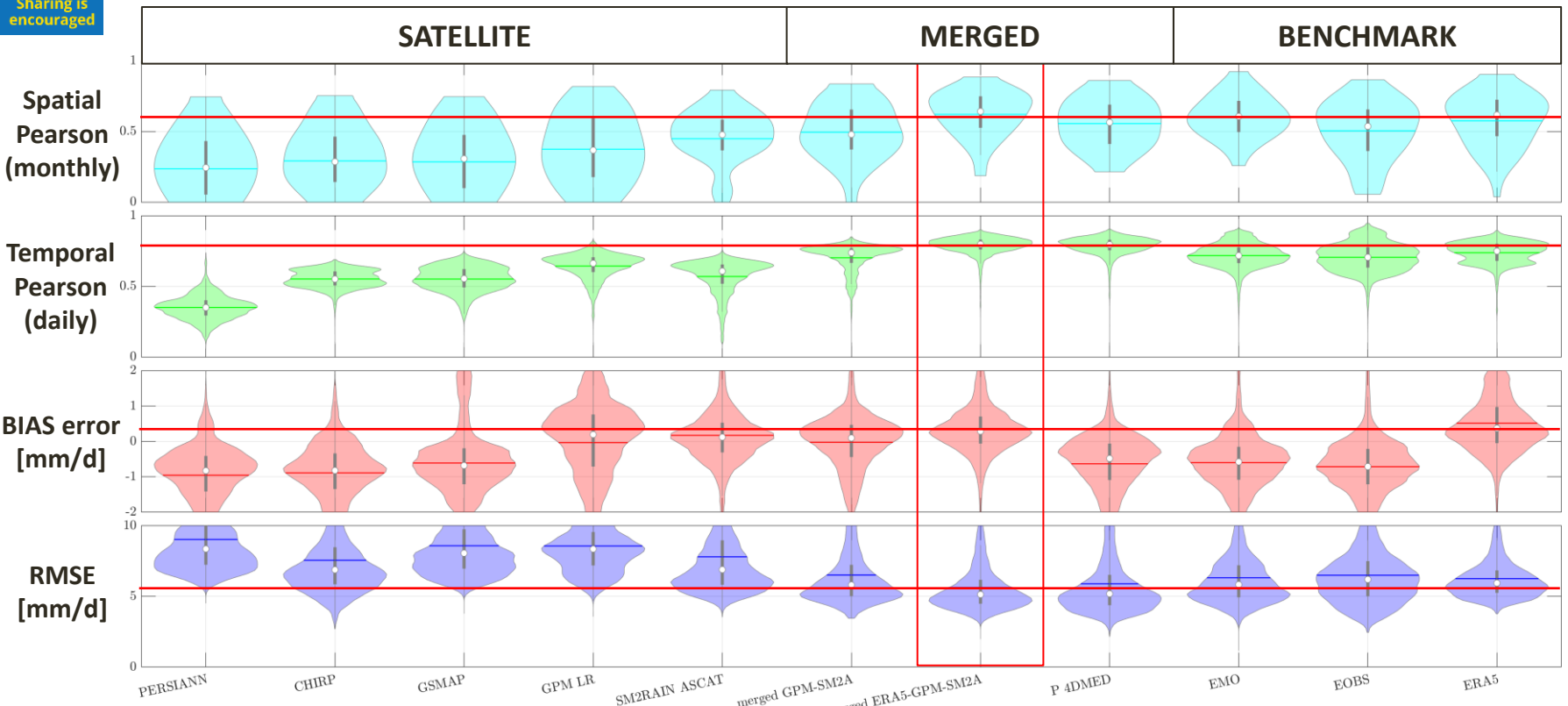
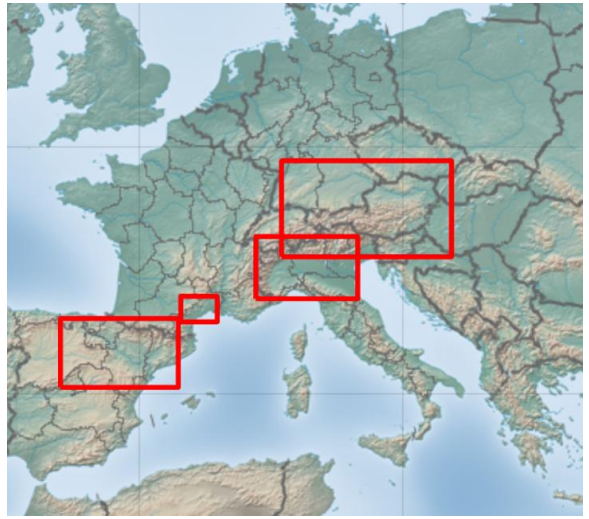


Po river basin



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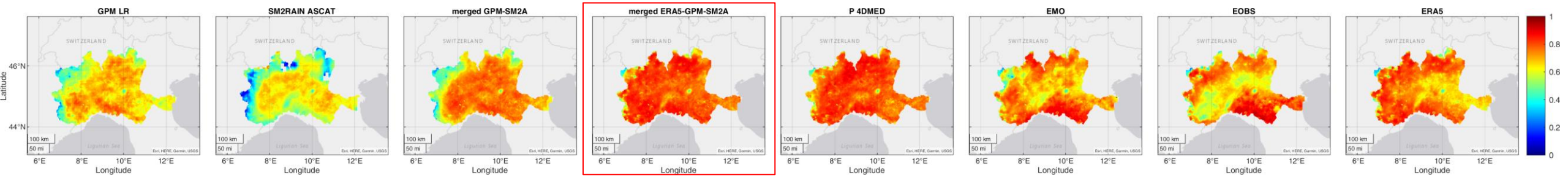

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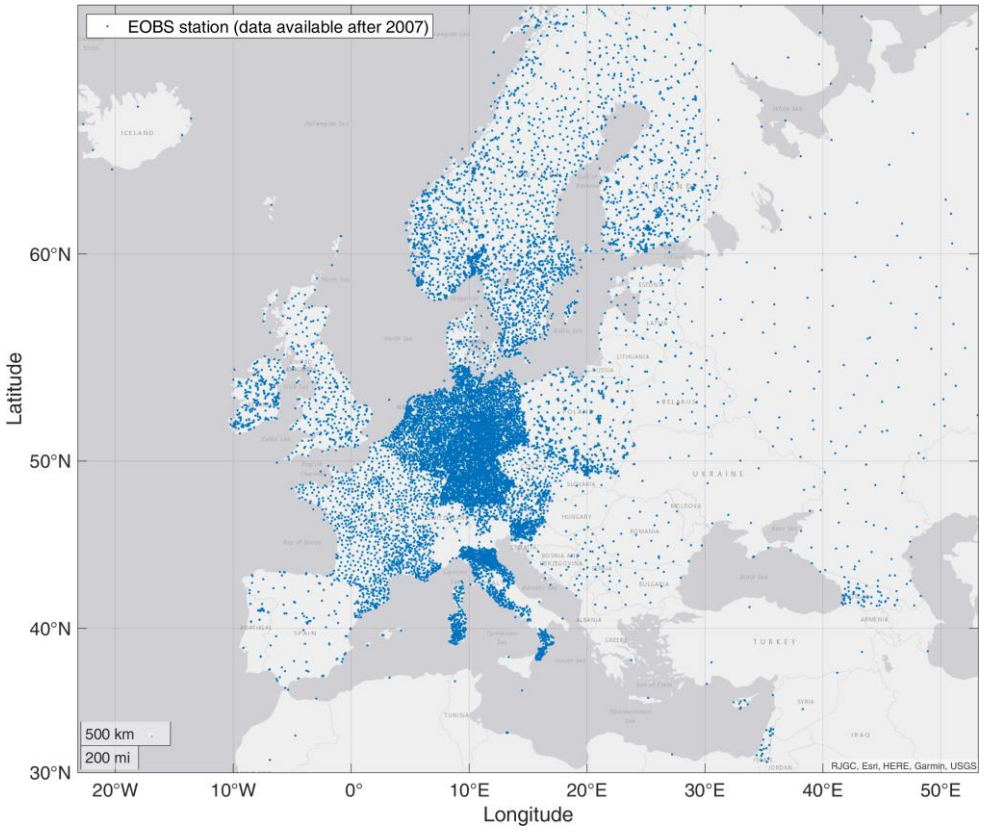
INTEGRATED PRECIPITATION PRODUCTS – CR RESULTS

Where is the truth?

Three coarse resolution benchmark products were collected: ERA5, EOBS and EMO. Which product should be use for comparison? (ERA5 excluded because used in merging)

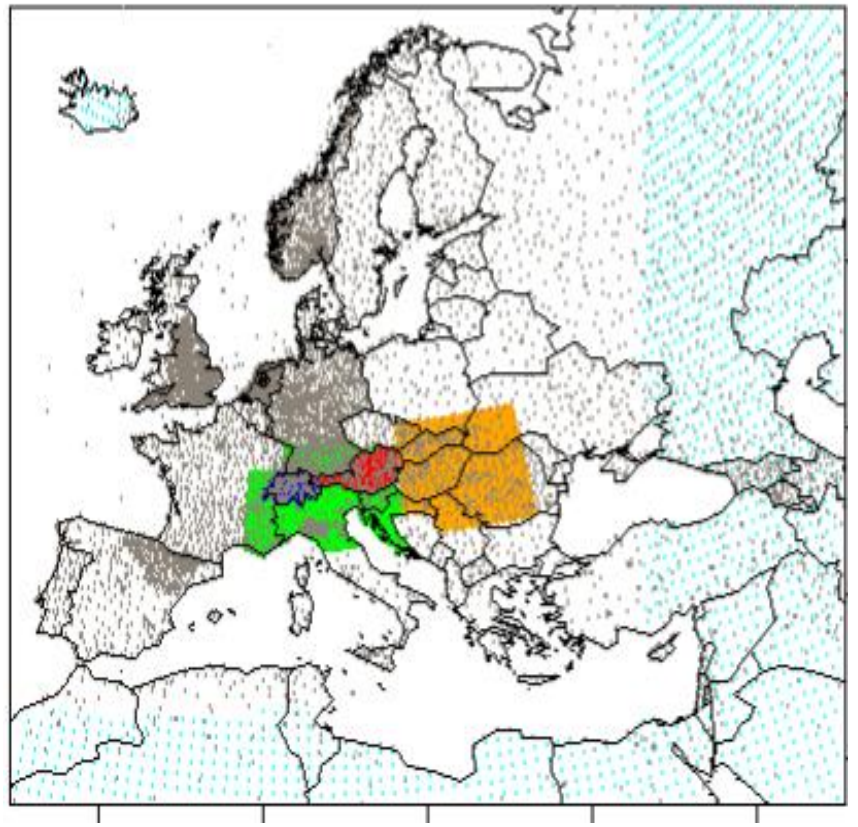
EOBS



EMO

Station location

- insitu stations
- INCA
- CarpatClim
- Euro4M-APGD
- CombiPrecip
- ERA-Interim



Thiemig et al.: **EMO-5: a high-resolution multi-variable gridded meteorological dataset for Europe**

INTEGRATED PRECIPITATION PRODUCTS – CR RESULTS

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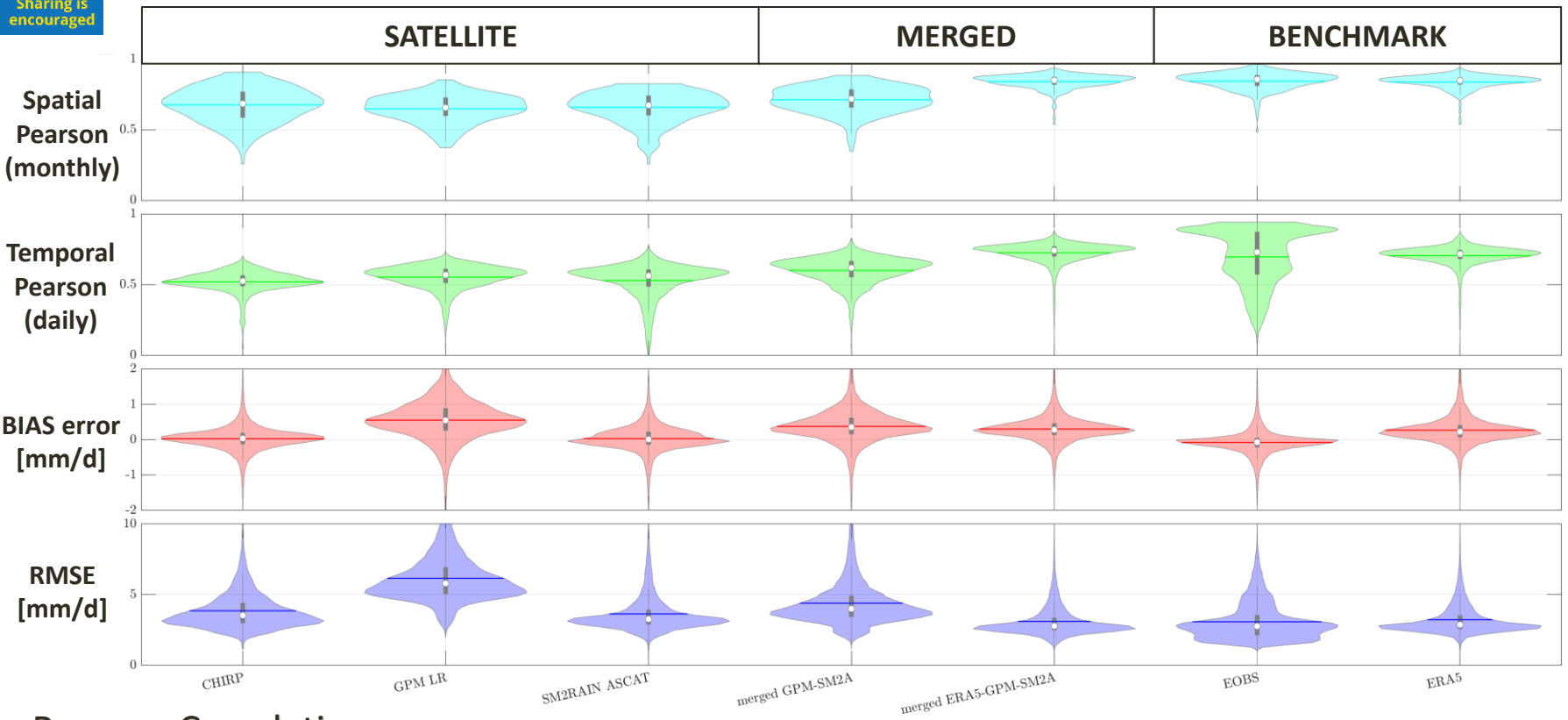
esa 4DHydr

Europe



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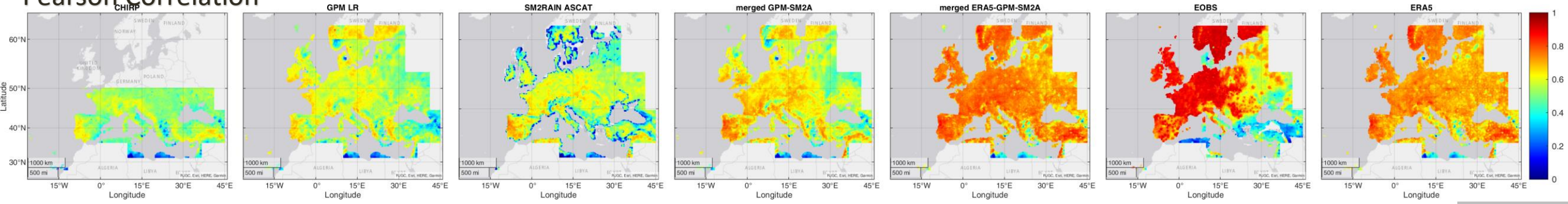

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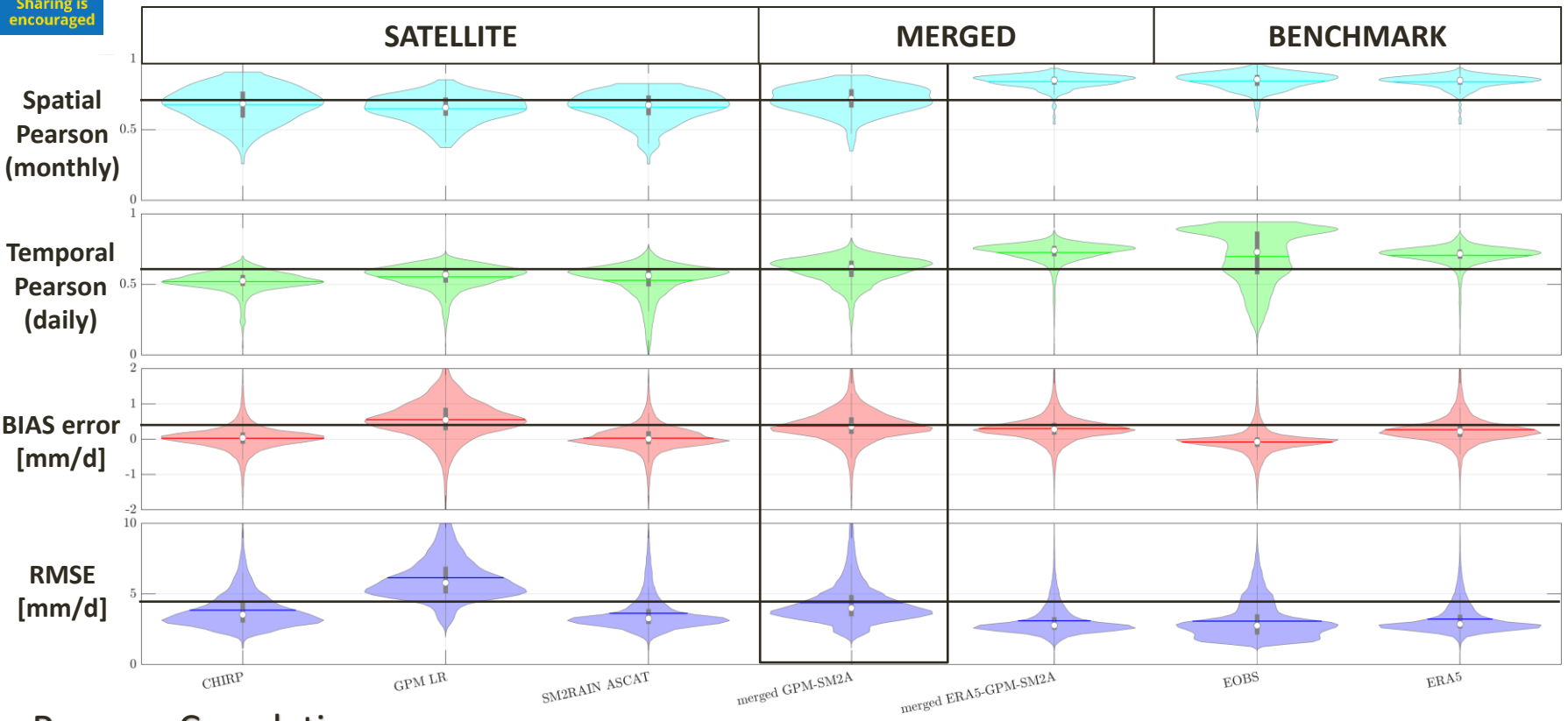
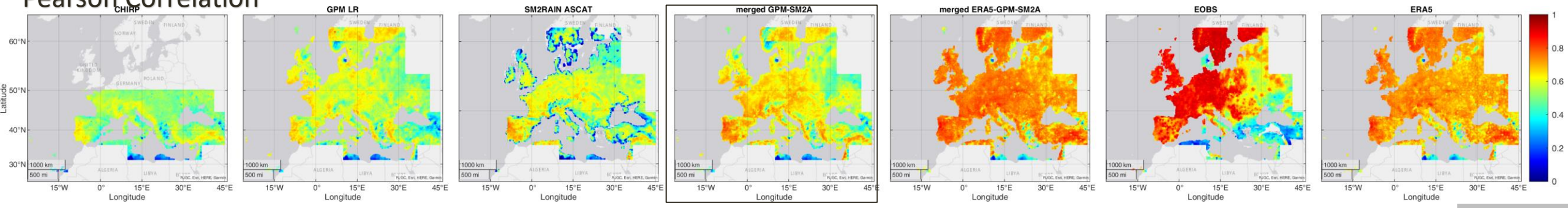


4DHydr

Europe

Pearson Correlation



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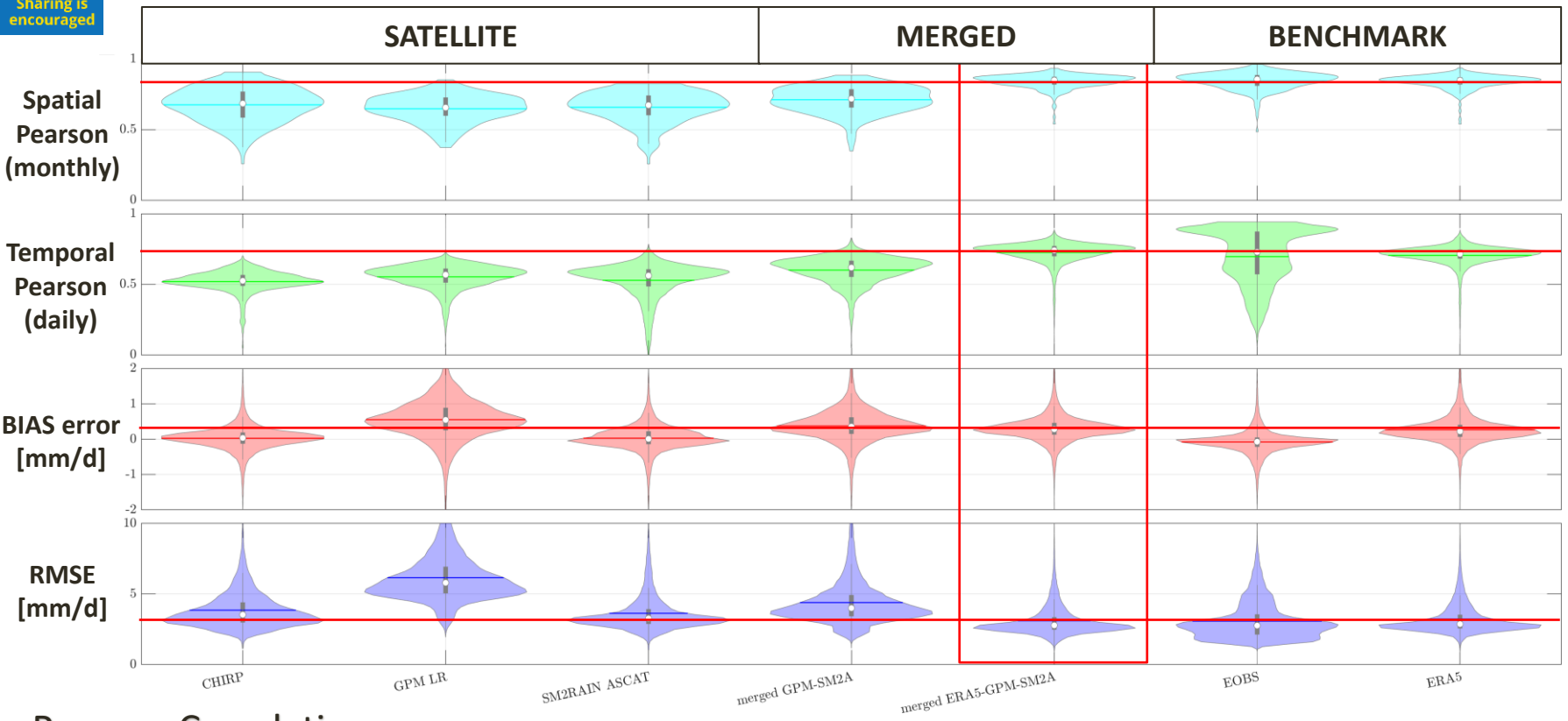

Europe

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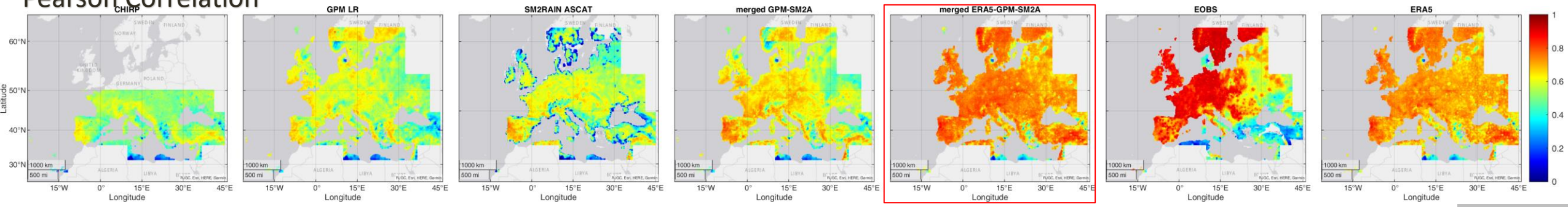

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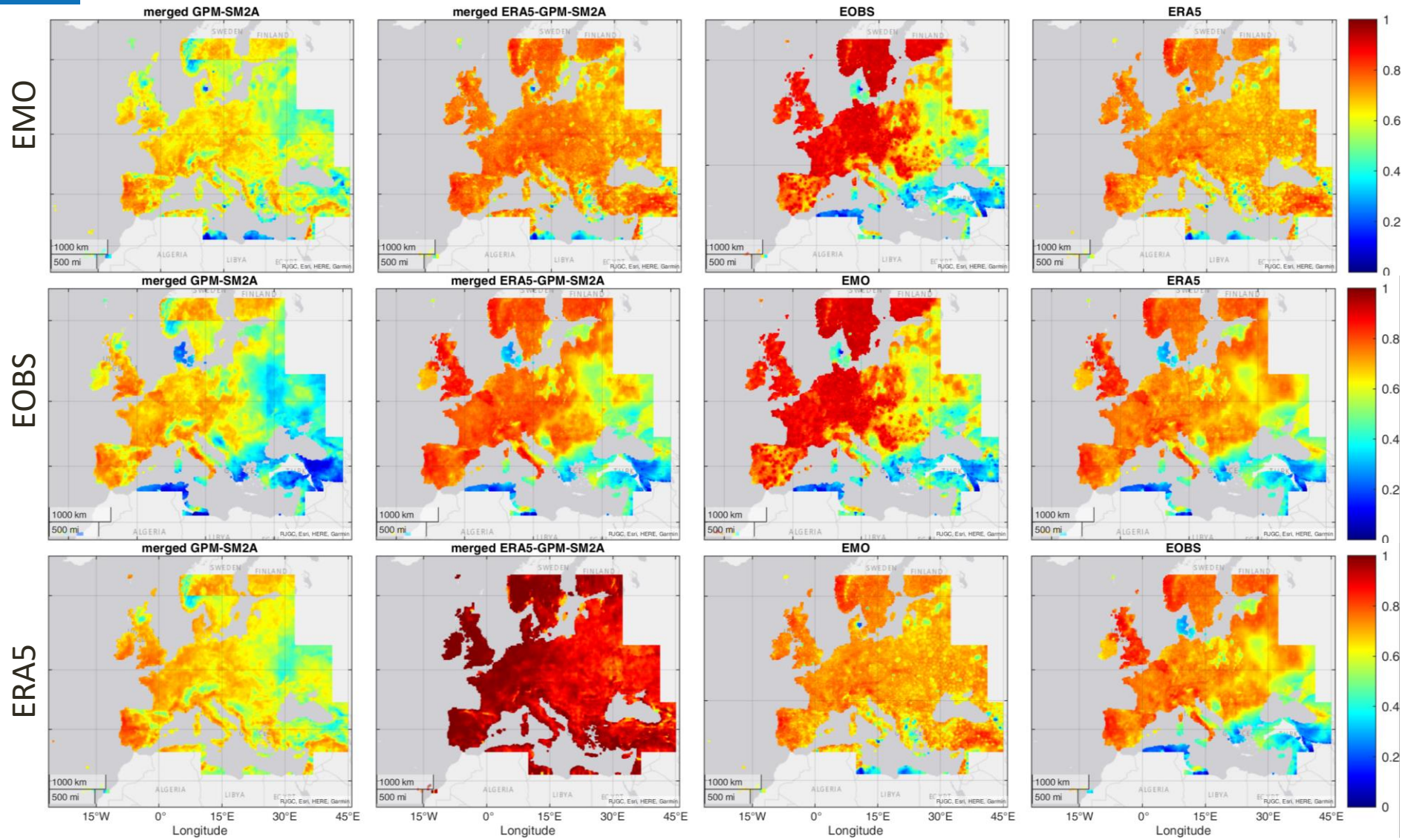

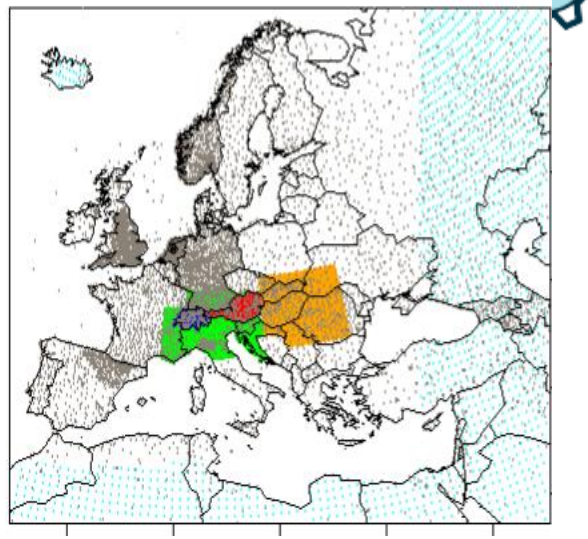

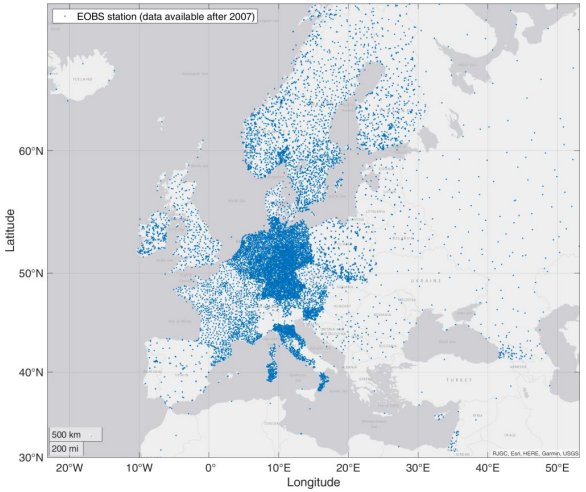

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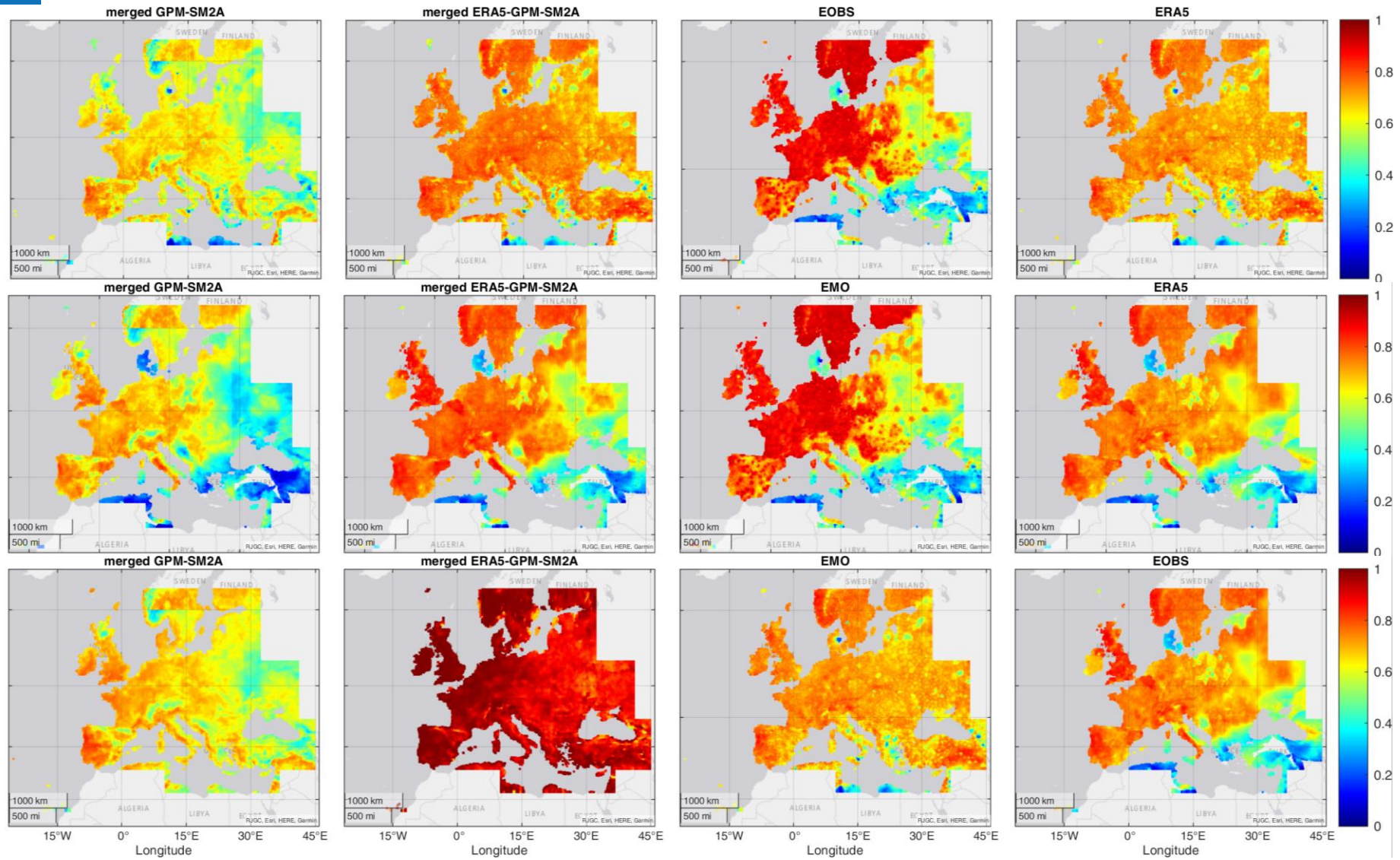

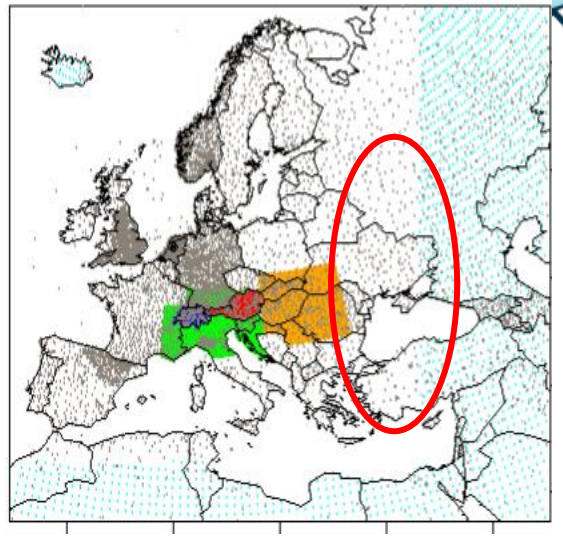

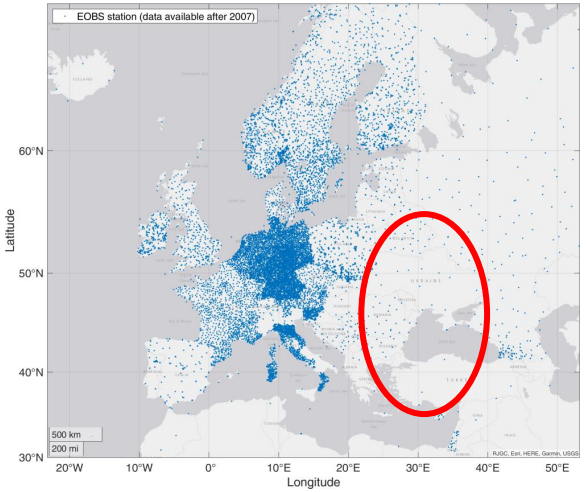

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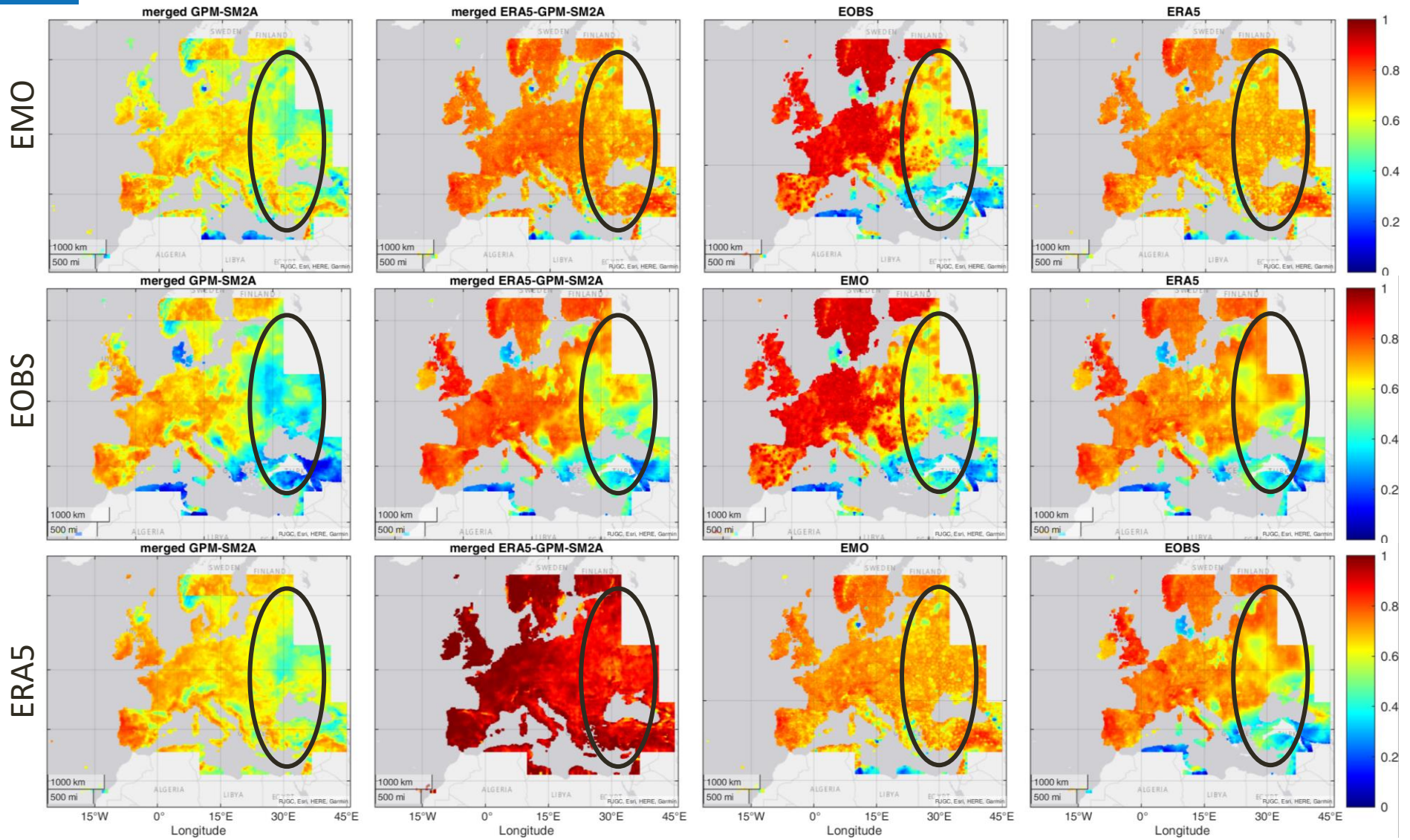

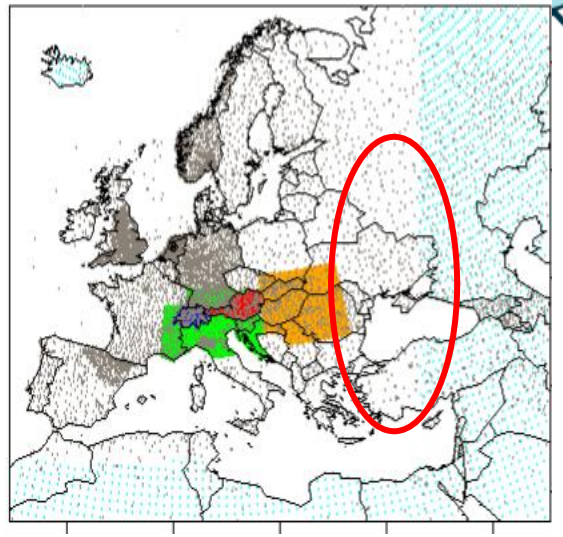

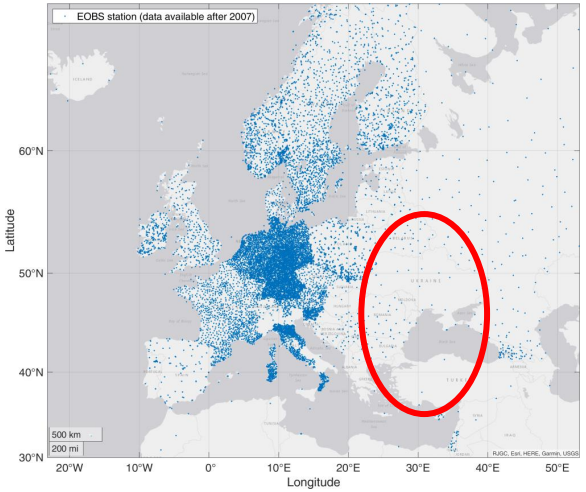

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INTEGRATED RAINFALL PRODUCTS – CONCLUSIONS AND NEXT STEPS

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INTEGRATED RAINFALL PRODUCTS – CONCLUSIONS AND NEXT STEPS

- **Two high spatial (1 km) and temporal (daily) resolution precipitation products** from the integration of satellite and satellite +reanalysis data were created by downscaling coarse resolution precipitation data;

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