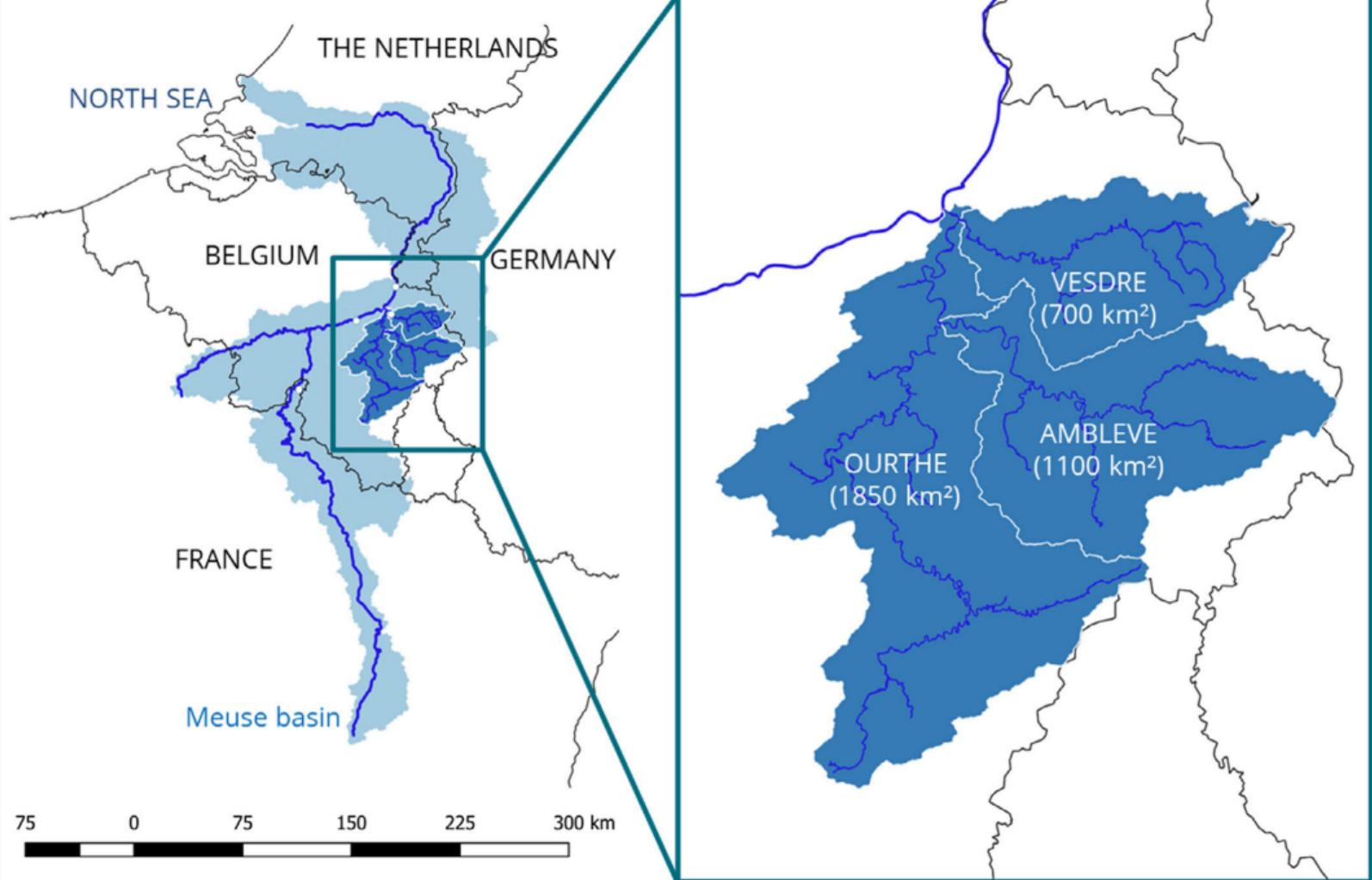# ESTIMATION AND ANALYSIS OF EXTREME RAINFALL IN BELGIUM DURING THE JULY 2021 FLOOD EVENT

Edouard Goudenhoofdt, Laurent Delobbe and Michel Journee

September 2, 2022

THE NETHERLANDS

NORTH SEA

BELGIUM

GERMANY

FRANCE

Meuse basin

75 0 75 150 225 300 km

VESDRE
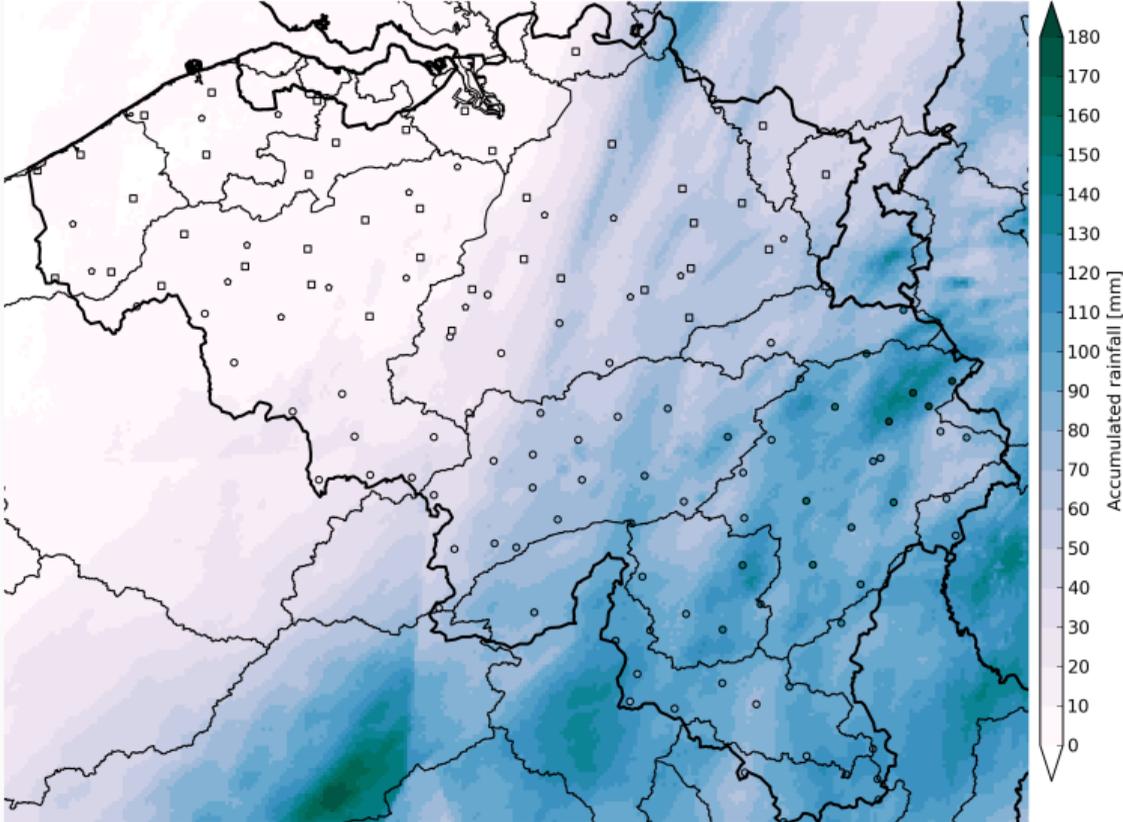(700 km²)

OURTHE
(1850 km²)

AMBLEVE
(1100 km²)

Extremely severe impacts

- 39 fatalities mainly in the Vesdre catchment
- Estimated total cost above 3 billion euros
- Critical situation on the Meuse river with dam under maintenance

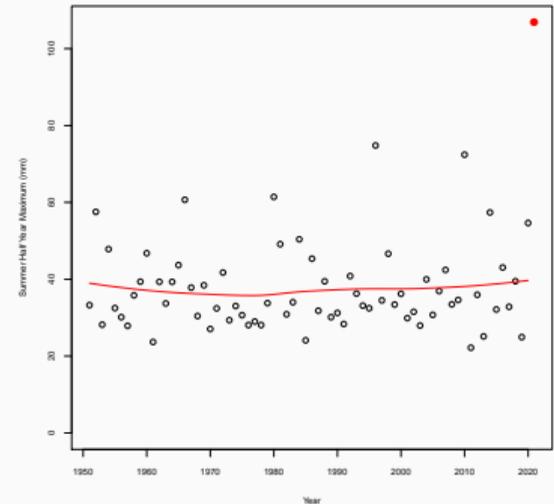# GOOD AGREEMENT WITH RAIN GAUGES OVERALL

2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]
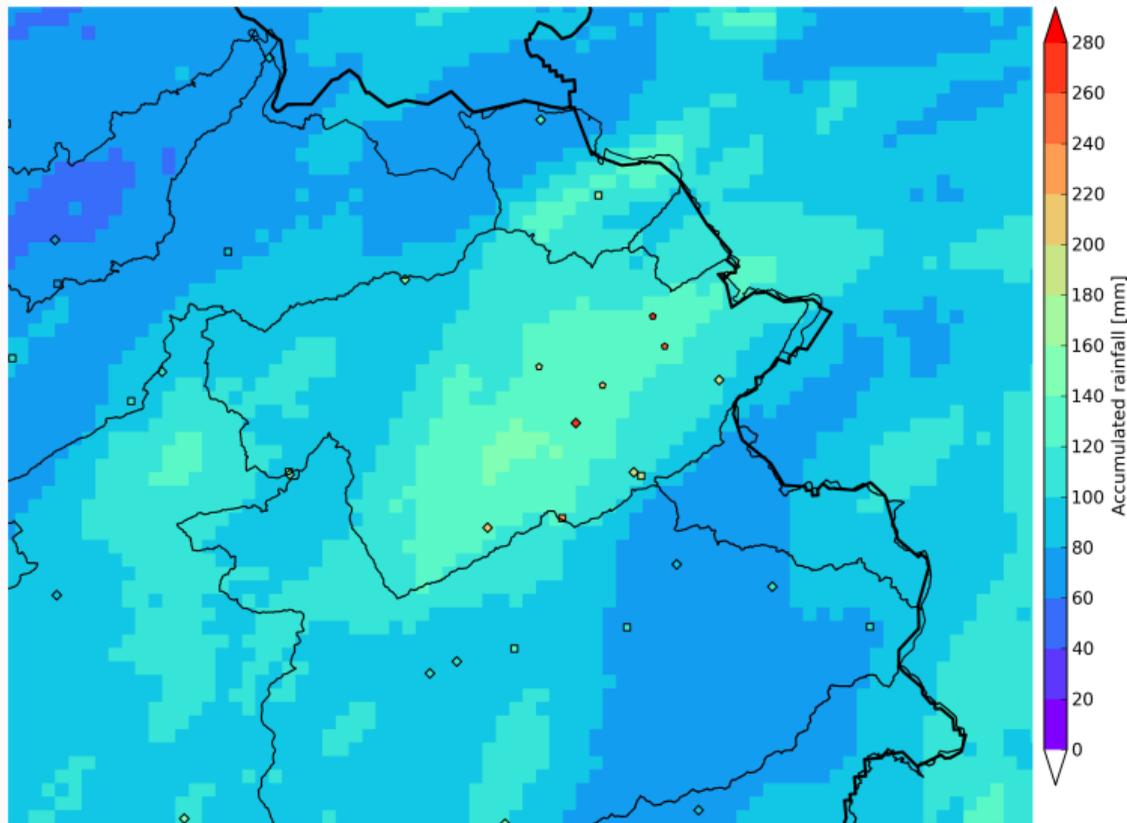
Operational product

- 5 weather radars
- Clutter mitigation
- ZR based on precip type

Two–Daily Areal Precipitation (Meuse Bassin, Belgium)

SIGNIFICANT UNDERESTIMATION LOCALLY OVER THE VESDRE

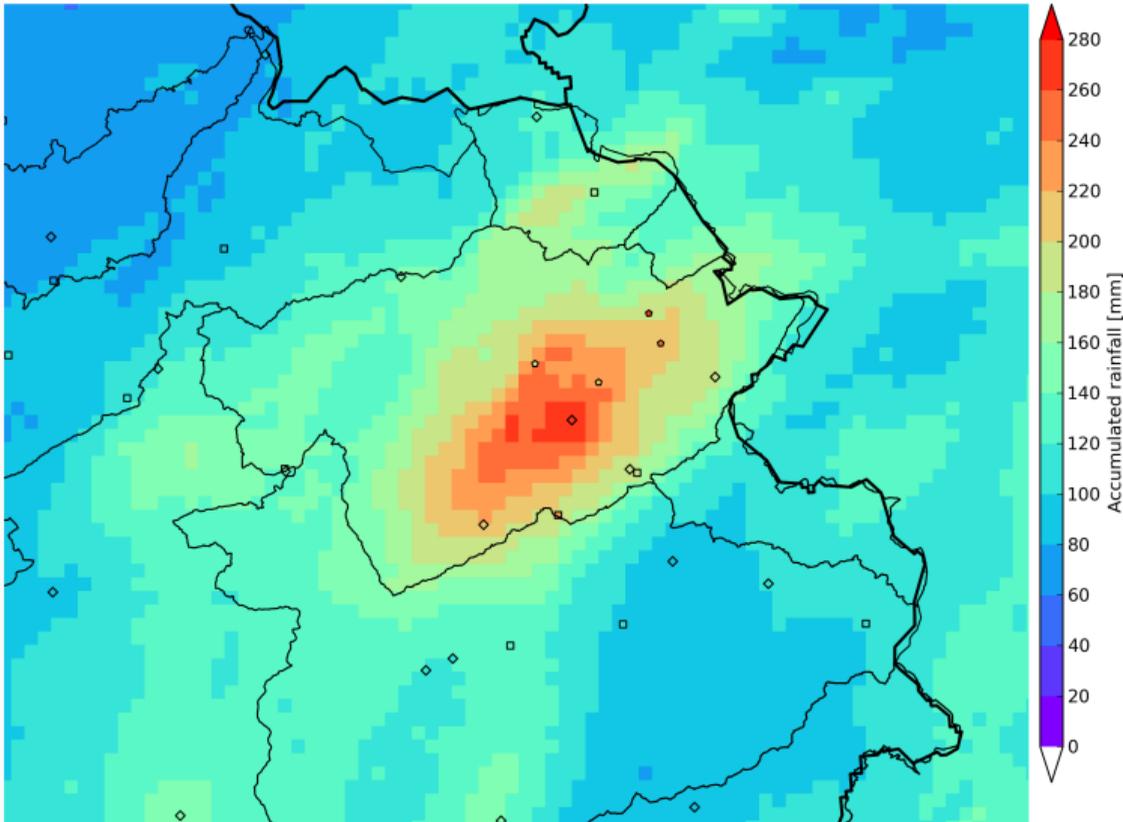2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]

Extra gauges

- Manual (squares)
- Dams (pentagons)

- 272 mm in 48h recorded by one gauge in the Vesdre catchment
- Previous record were 244 mm (1953) and 208 mm (1998)
- Much lower values over the Ambleve

EXTERNAL DRIFT KRIGING AS A QUICK FIX

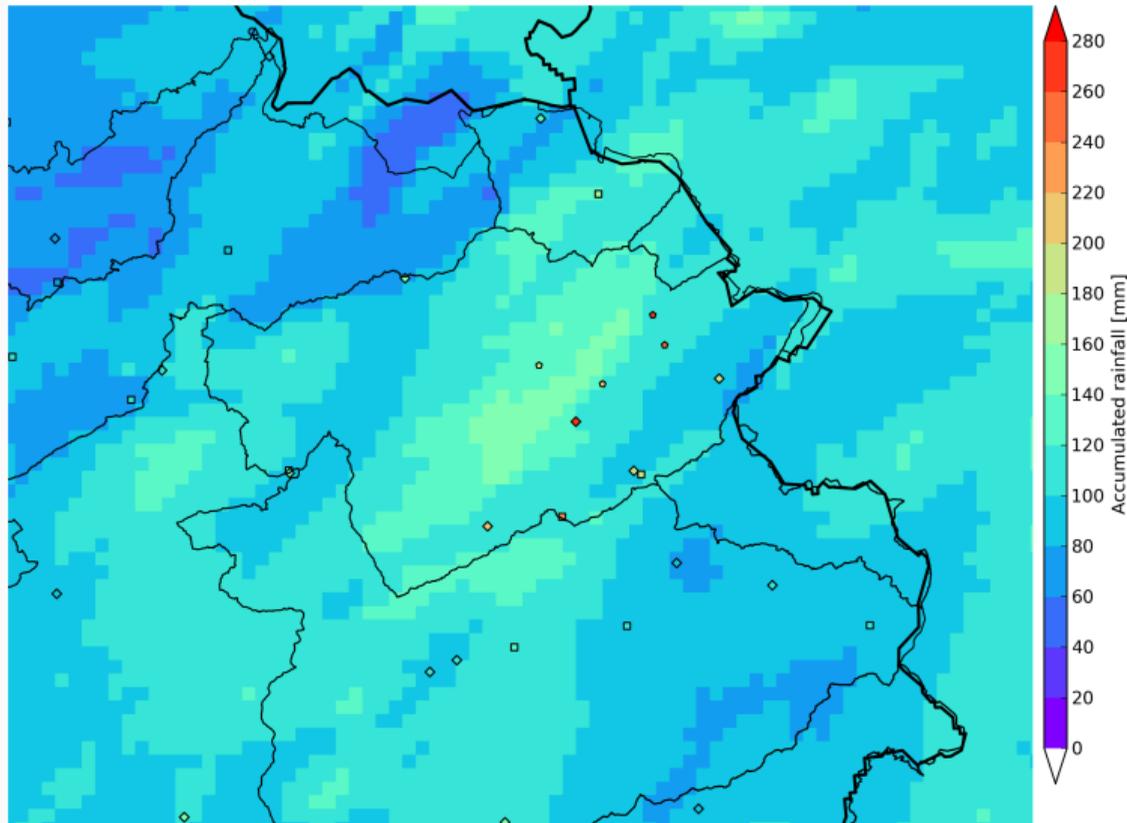2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]

Method

- Hourly accumulation
- Square root tranform
- Nearest 21 automatic gauges for interpolation
- IDW of 4 radar pixels at gauge location

- Extreme values captured
- Some spatial structure is lost

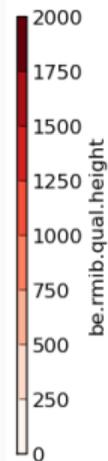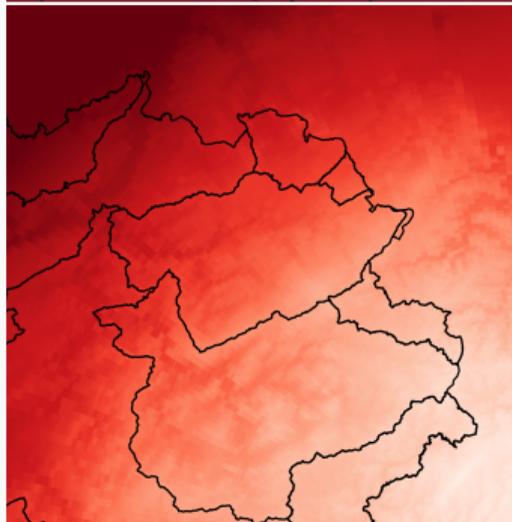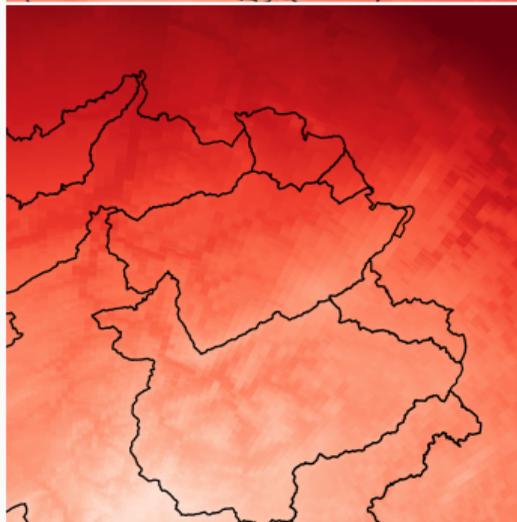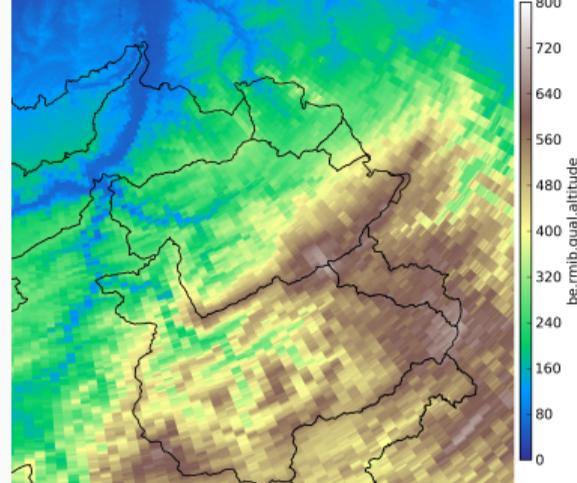# GENERAL IMPROVEMENTS OF THE RADAR PRODUCT

2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]

Method

- More robust calibration correction
- $Z = 70R^2$ over orography
- Use of the DWD Essen radar
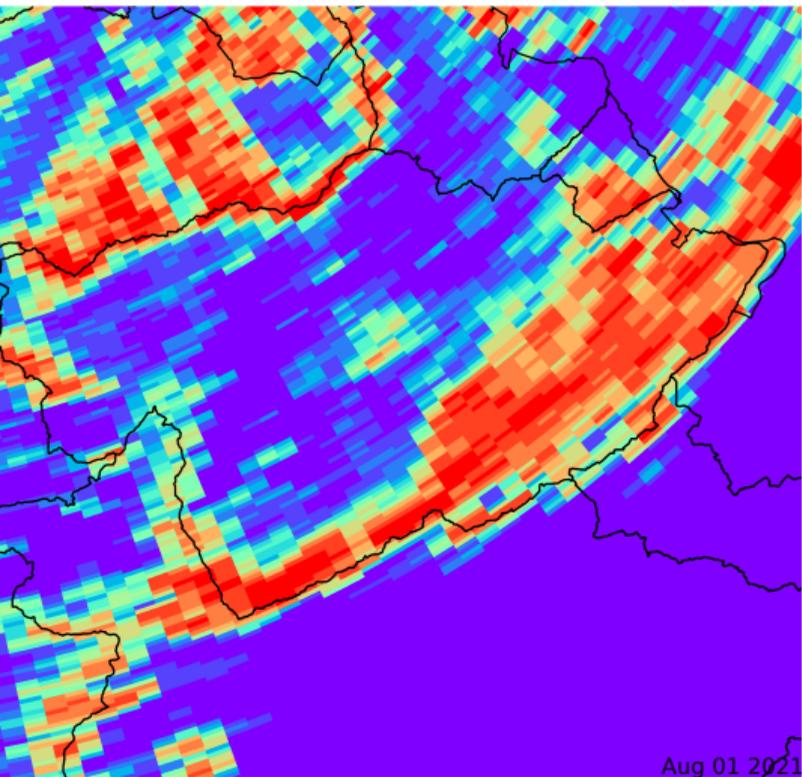- More robust single gauge bias correction

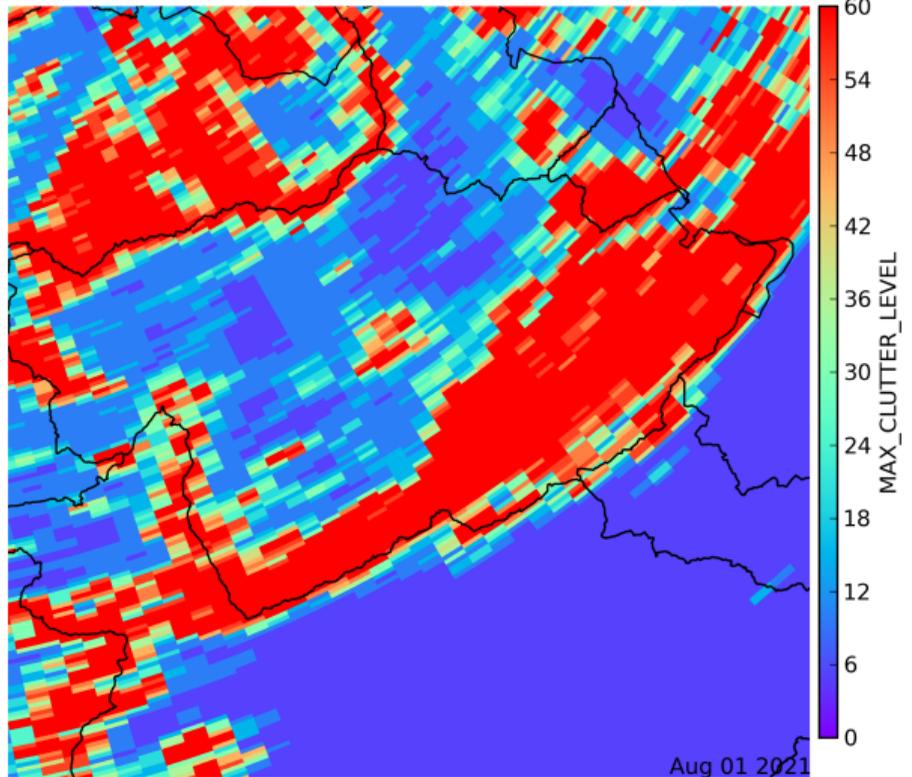- Only slight improvement for the extreme precipitation
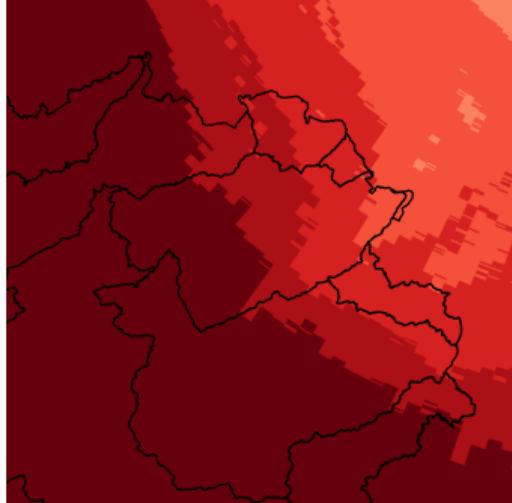
- Three radars above 1000m
- North West radar close to the ground

MEAN AND MAX CLUTTER LEVEL BEFORE DOPPLER FILTERING
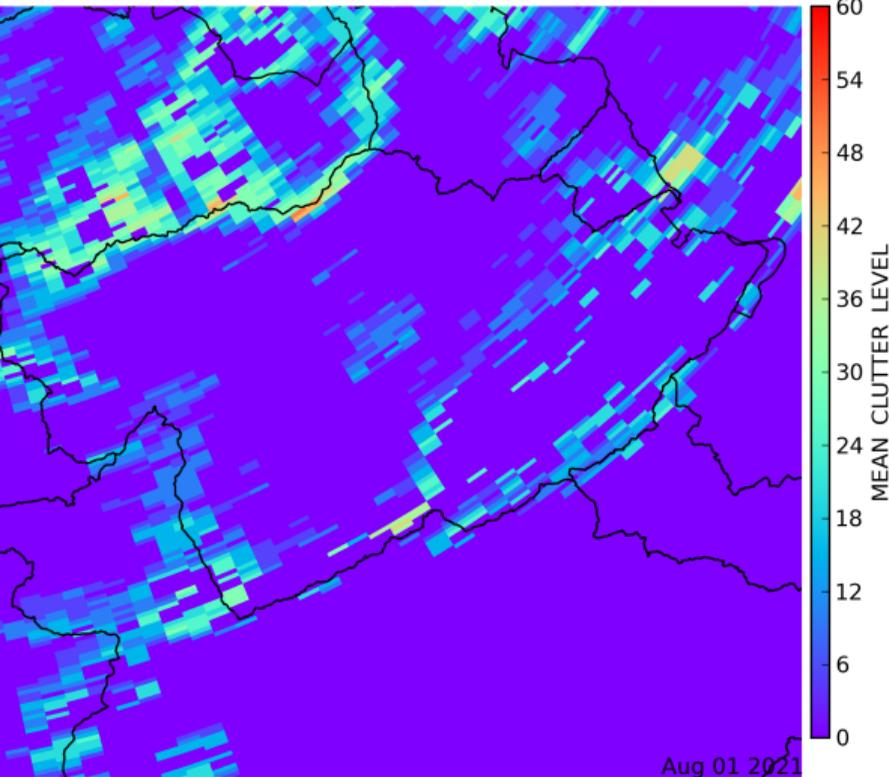

behel:SCAN 0.3ᵉ   Jun 01 2021

Aug 01 2021

behel:SCAN 0.3ᵉ   Jun 01 2021

Aug 01 2021

MEAN AND MAX CLUTTER LEVEL AFTER DOPPLER FILTERING

behel:SCAN 0.3ᵉ   Jun 01 2021

behel:SCAN 0.3ᵉ   Jun 01 2021

MEAN_CLUTTER_LEVEL

MAX_CLUTTER_LEVEL
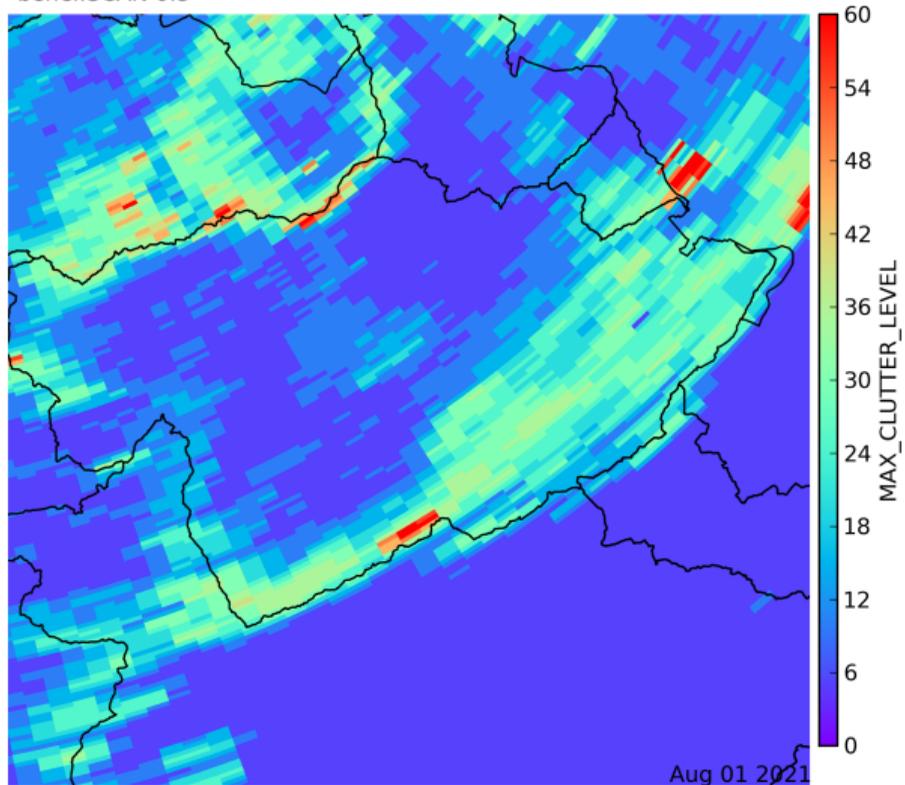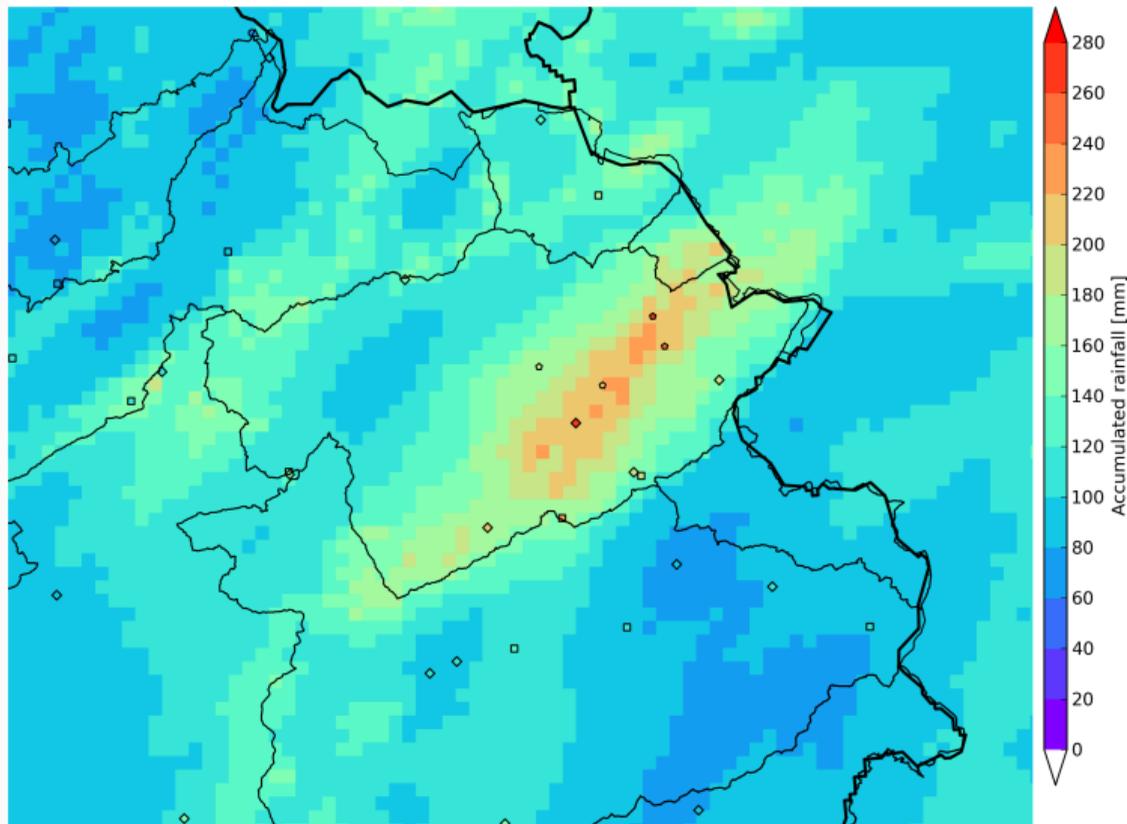
Aug 01 2021   Aug 01 2021

WE RECOVER PRECIPITATION FROM THE STATIC CLUTTER MAP

2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]

Method

- Keep values exceeding the max DBZH clutter level by 3dB
- Discard values below 30dB (residual clutter)
- Discard values 30dB below the mean TH clutter level (false zeros from post processing)

WE RECOVER PRECIPITATION FROM THE STATIC CLUTTER MAP

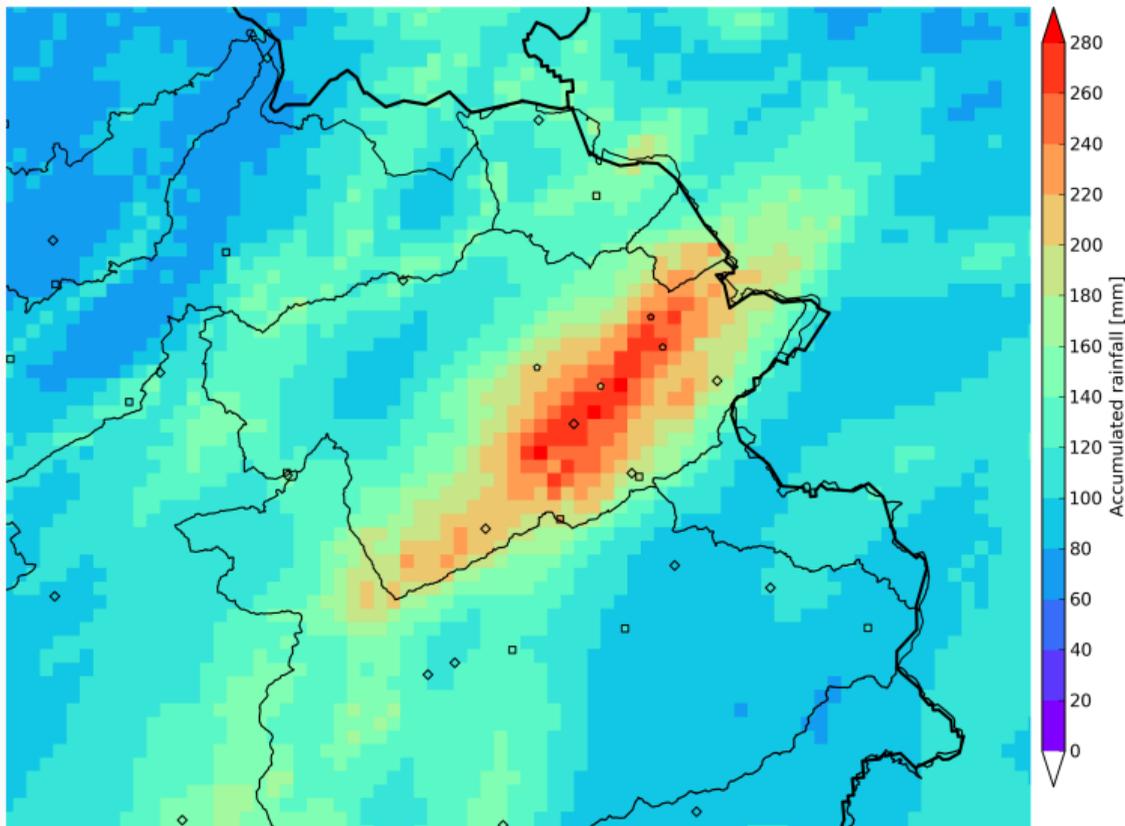2021-07-13 06:00 => 2021-07-15 06:00 UTC

Accumulated rainfall [mm]

Method

- Keep values exceeding the max DBZH clutter level by 3dB

- Discard values below 30dB (residual clutter)

- Discard values 30dB below the mean TH clutter level (false zeros from post processing)

- Spatial structure is kept after gauge merging