THE RAINFALL ESTIMATION CHALLENGE FOR THE JULY 2021 FLOOD

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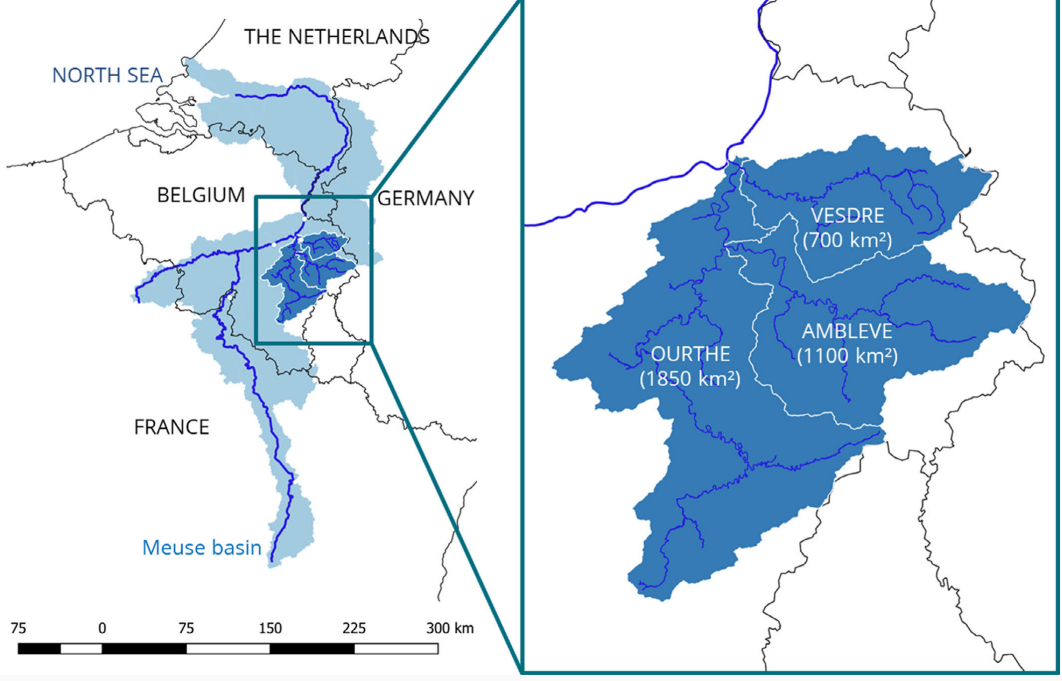
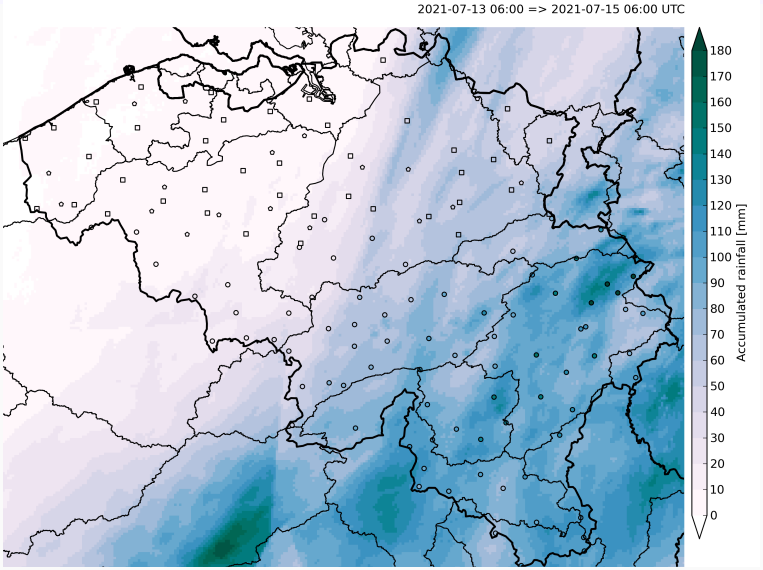

THE NETHERLANDS
NORTH SEA
BELGIUM
GERMANY
FRANCE
Meuse basin
75
0
75
150
225
300 km
VESDRE
(700 km²)
AMBLEVE
(1100 km²)
OURTHE
(1850 km²)

Extremely severe impacts

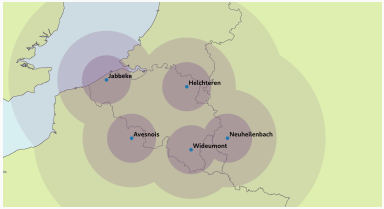
- 39 fatalities mainly in the Vesdre catchment
- Estimated total cost above 3 billion euros
- Critical situation on the Meuse river with dam under maintenance

RADQPE IN AGREEMENT WITH RAIN GAUGES OVERALL

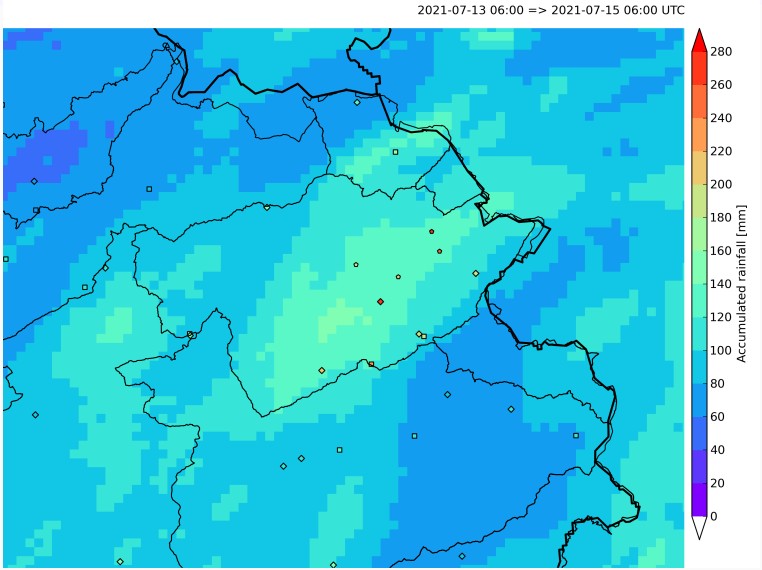


Operational product

- Mitigation of clutter (non-meteorological radar echoes)
- Composite of radars measurements within 180km



SIGNIFICANT UNDERESTIMATION LOCALLY OVER THE VESDRE

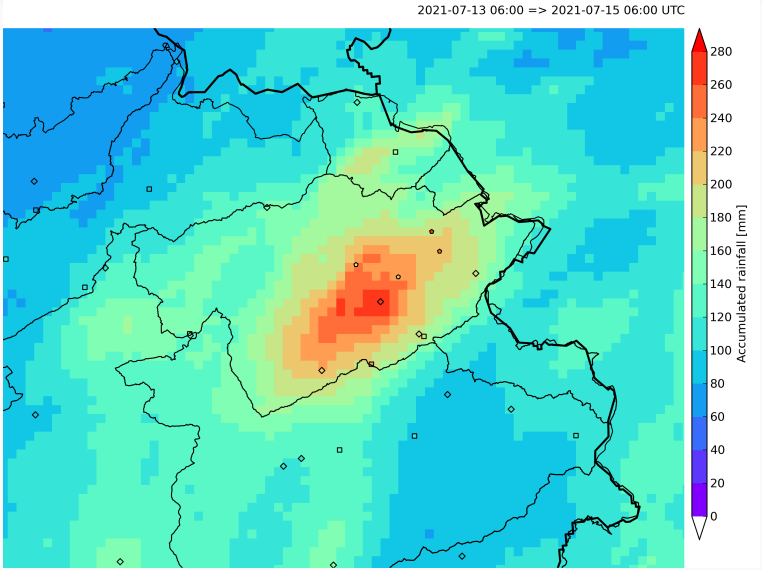


Extra gauges

- 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

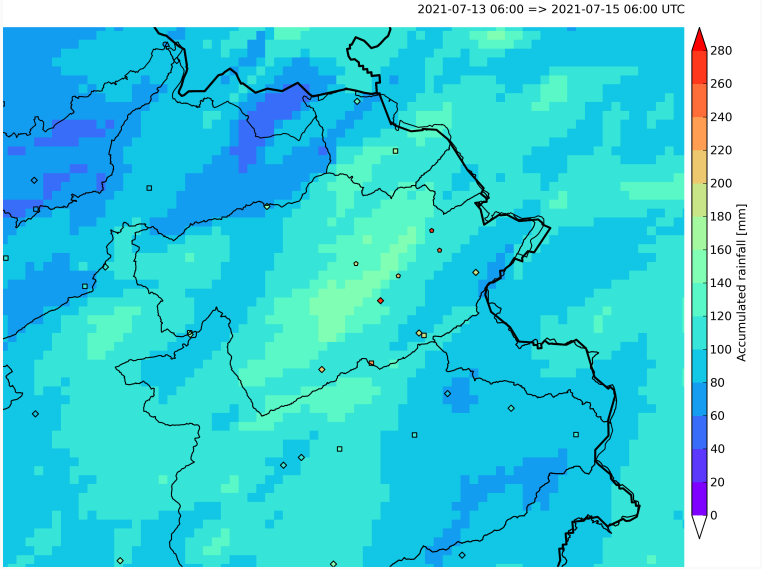


Method

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

- Extreme values captured
- Some spatial structure is lost

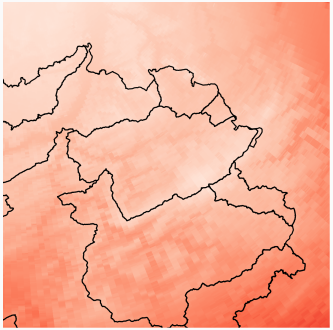
GENERAL IMPROVEMENTS OF THE RADAR PRODUCT

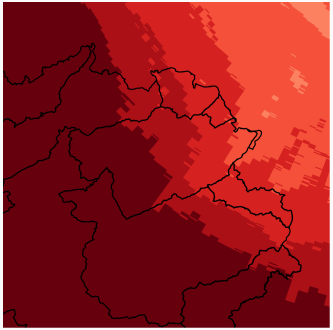


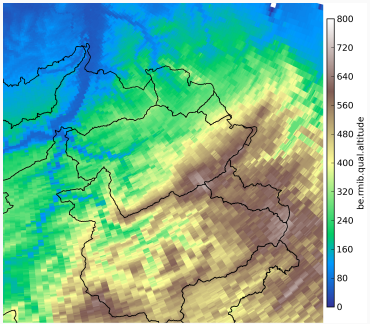
Method

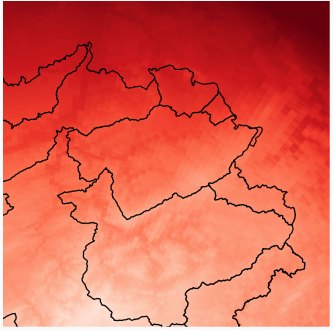
- More robust calibration correction
- $Z = 75R^2$ over orography
- Use of the DWD Essen radar
- More robust single gauge bias correction

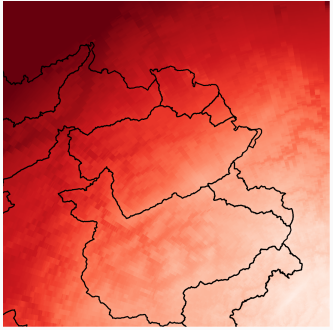
- Only slight improvement for the extreme precipitation

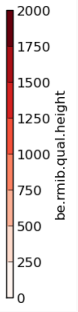






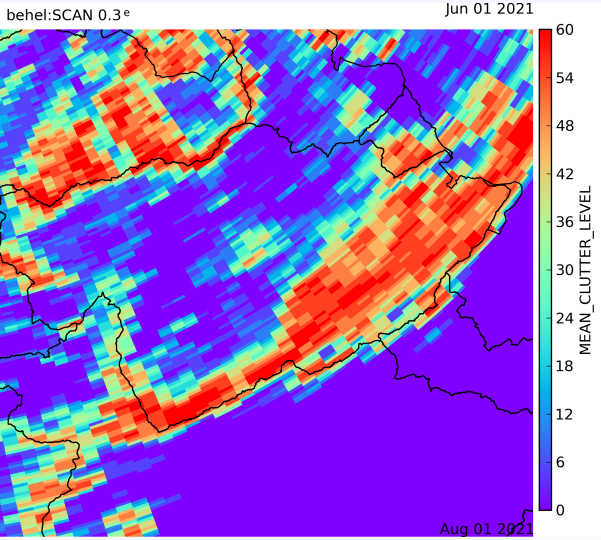


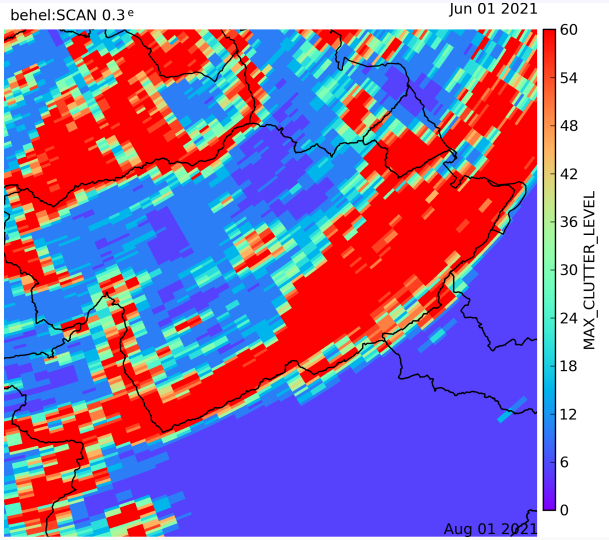




- Three radars with measurement height above 1000 m
- Radar of Helchteren (NW) below 300 m

MEAN AND MAX CLUTTER LEVEL BEFORE DOPPLER FILTERING





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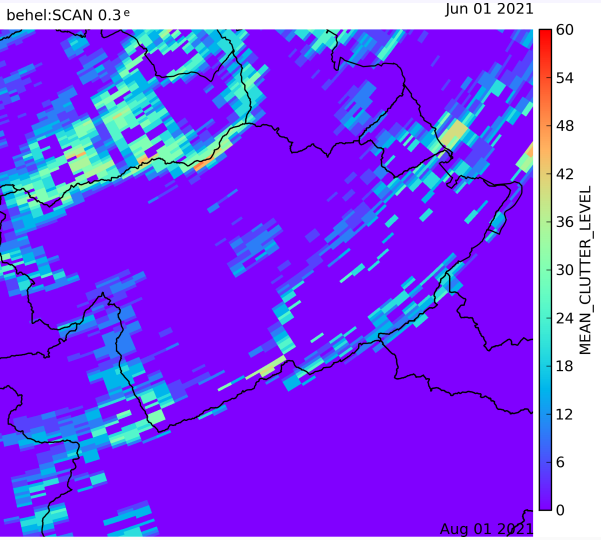
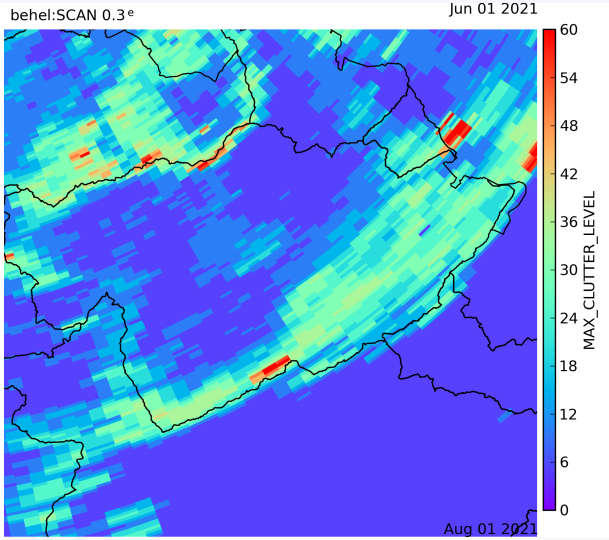
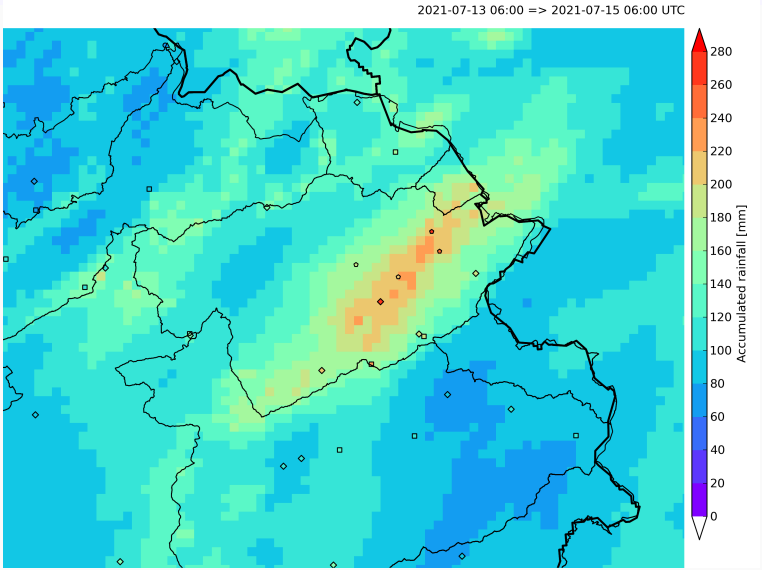




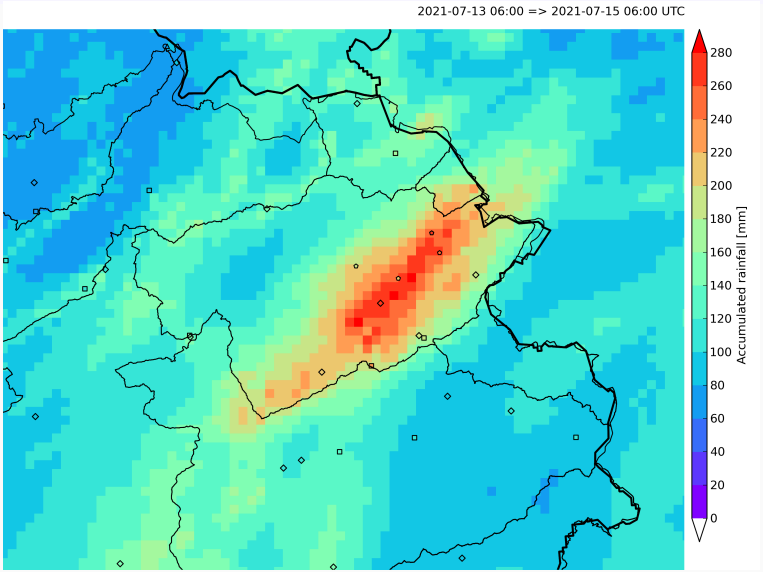
WE RECOVER PRECIPITATION FROM THE STATIC CLUTTER MAP



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



Method

- Keep values exceeding the max DBZH clutter level by 3dB
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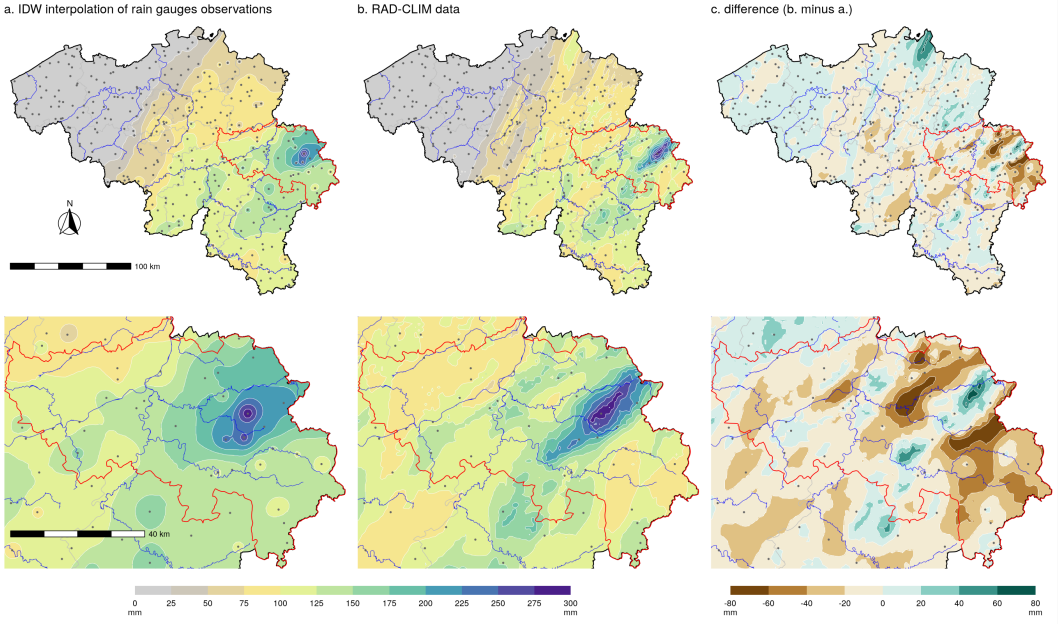
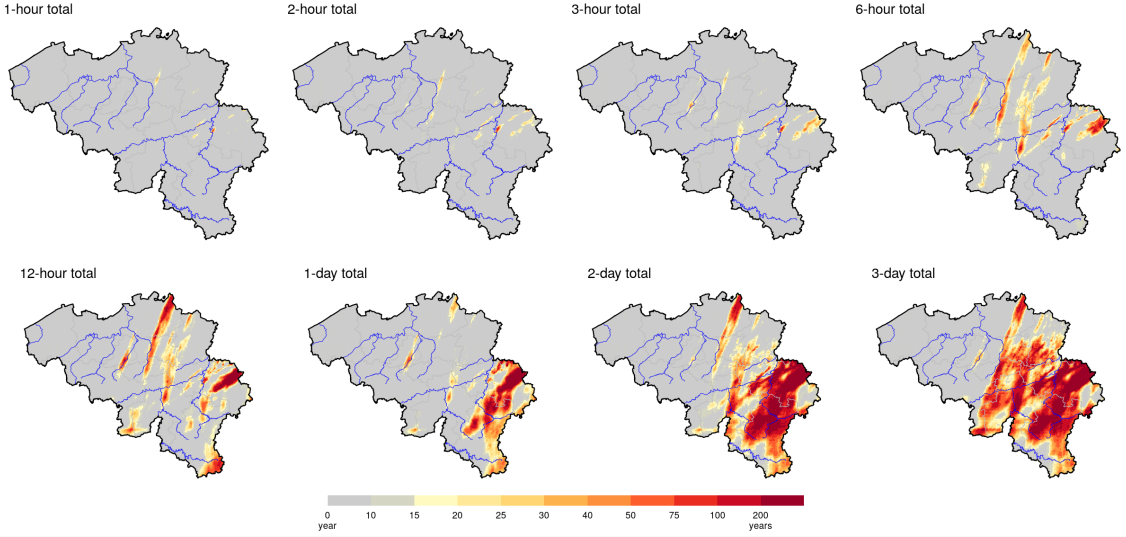
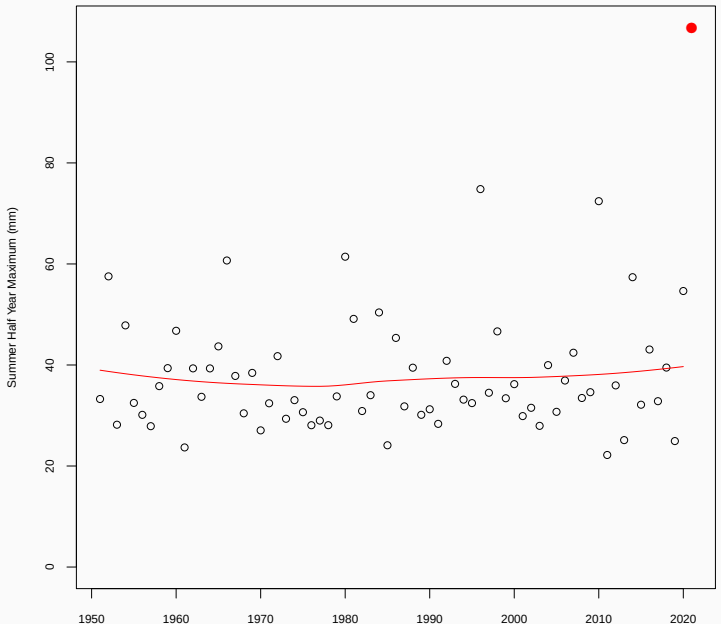
- Spatial structure is kept after gauge merging


3-day precipitation accumulation (from 13th July 06:00 UTC to 16th July 2021 06:00 UTC)
a. IDW interpolation of rain gauges observations
b. RAD-CLIM data
c. difference (b. minus a.)
N
100 km
40 km
0 mm
25
50
75
100
125
150
175
200
225
250
275
300 mm
-80 mm
-60
-40
-20
0
20
40
60
80 mm

Return period of the maximum accumulation for durations from 1 hour to 3 days




Two−Daily Areal Precipitation (Meuse Bassin, Belgium)
Summer Half Year Maximum (mm)
0
20
40
60
80
100
1950
1960
1970
1980
1990
2000
2010
2020