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Enhancement of radar rainfall estimates for Estonian territory through optical flow temporal interpolation

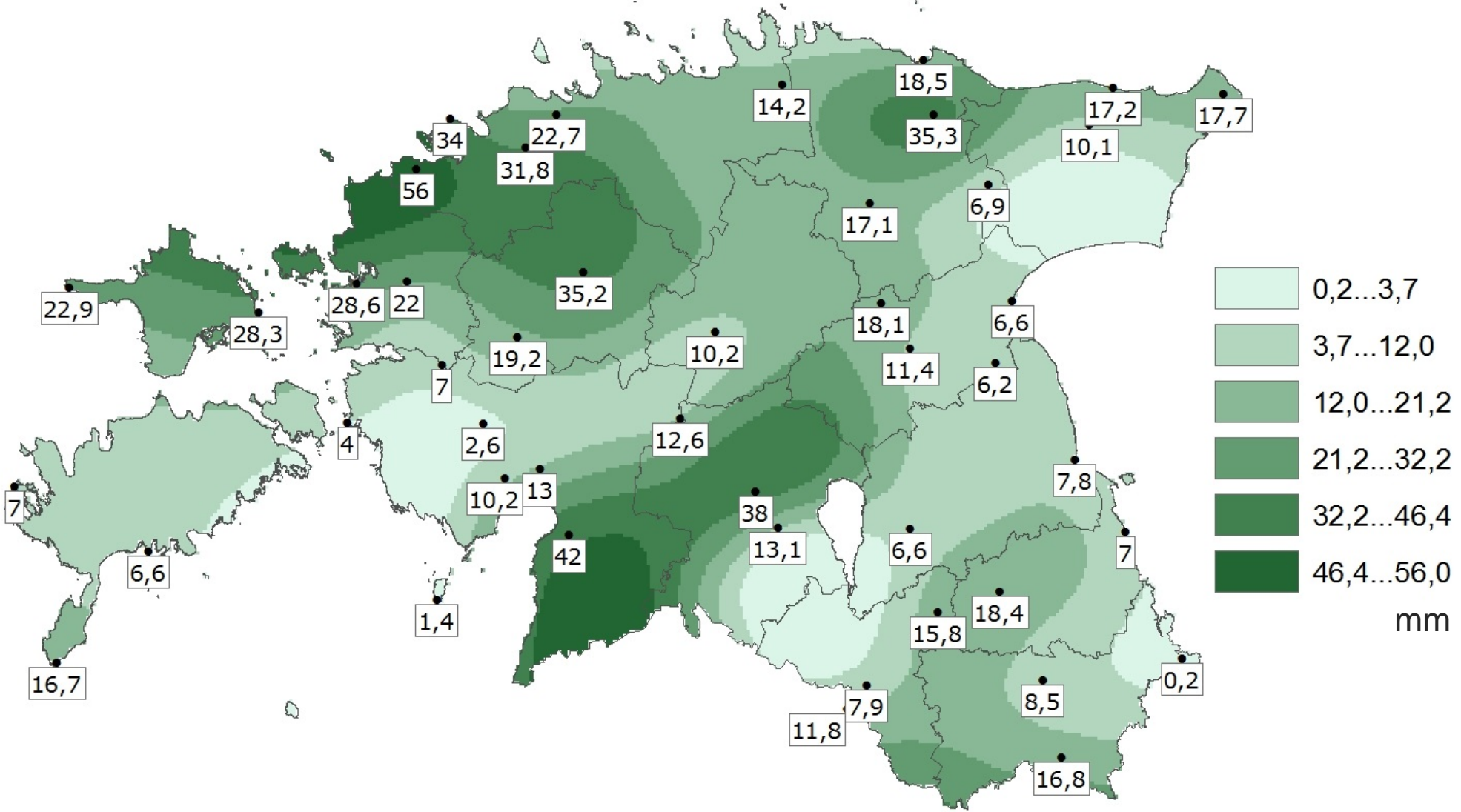
Jorma Rahu

13.06.2018 Helsingor



Contents

- Problem description
- Weather radar
- Optical flow
- Data processing
- Results



Source: Estonian Weather Sercive

Previous studies using optical flow on

radar data
Urban hydrology application → need for better spatial distribution of precipitation fields over urban areas

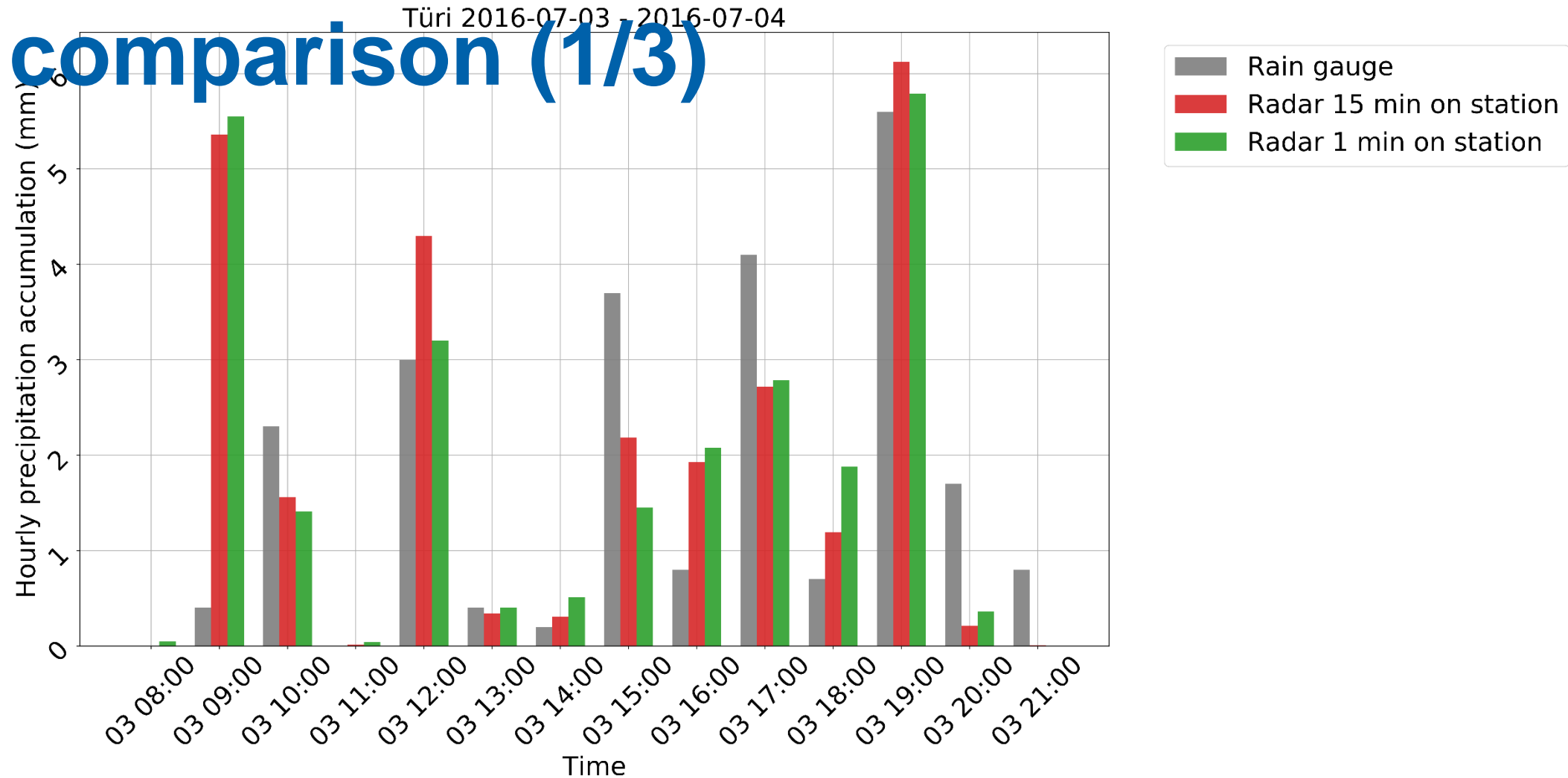
- Radar data extrapolation with optical flow (nowcasting)



Weather radar

RADAR – Radio Detection And Ranging

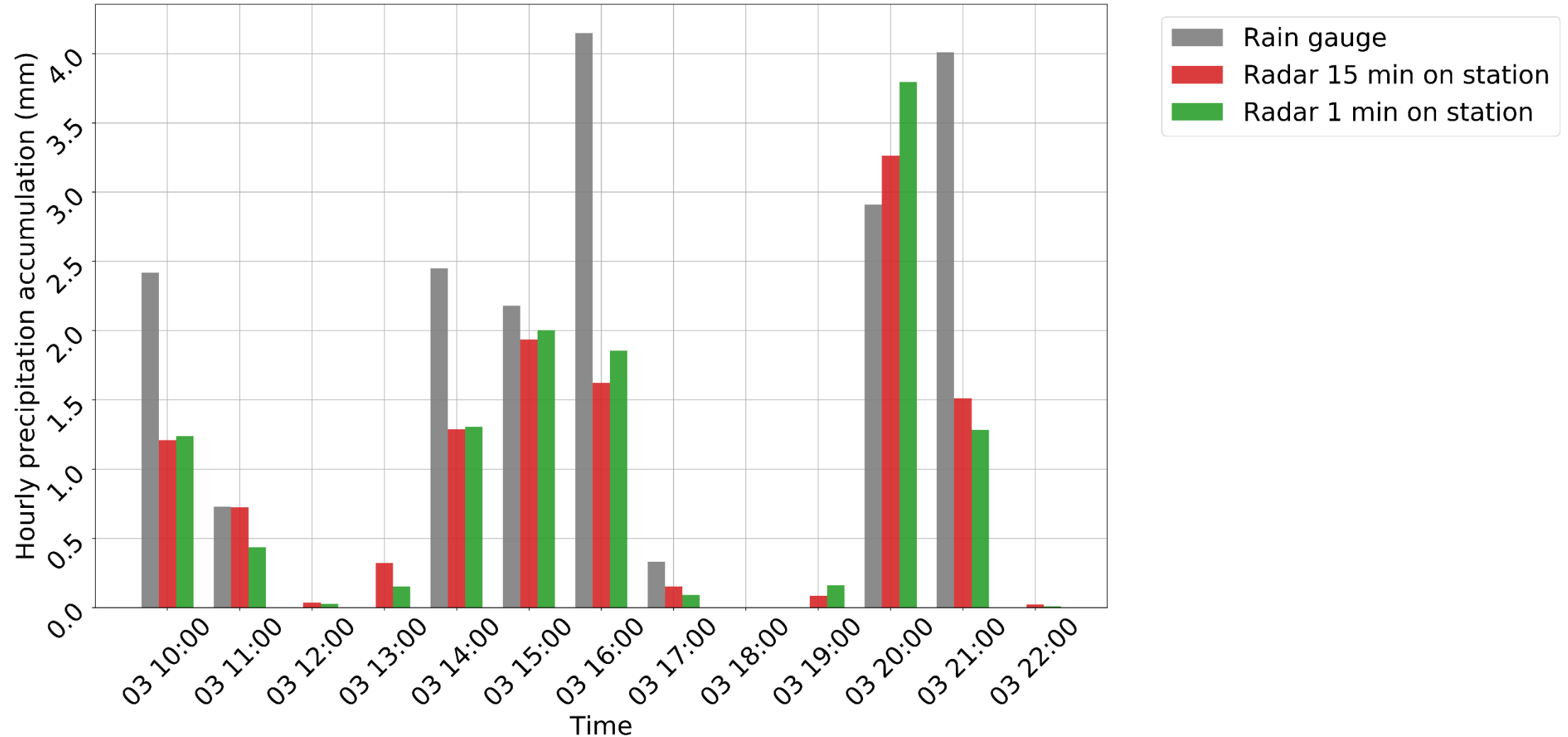
Rain gauge and radar data comparison (1/3)



Rain gauge and radar data comparison (2/3)

Convective case

Kuusiku 2016-07-03 - 2016-07-04

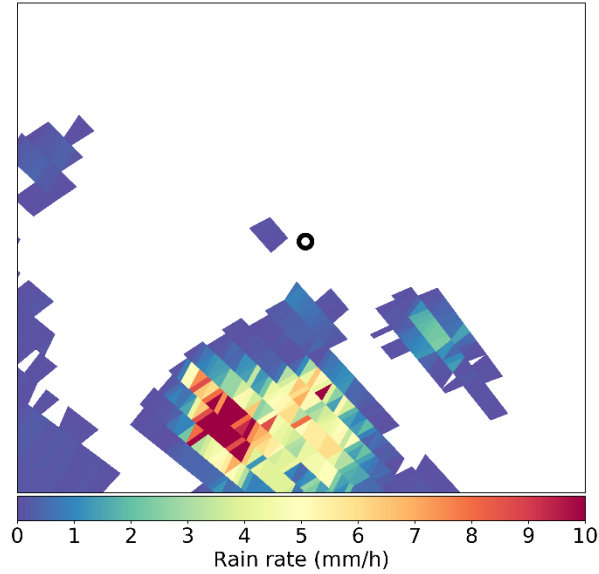


Kuusiku station

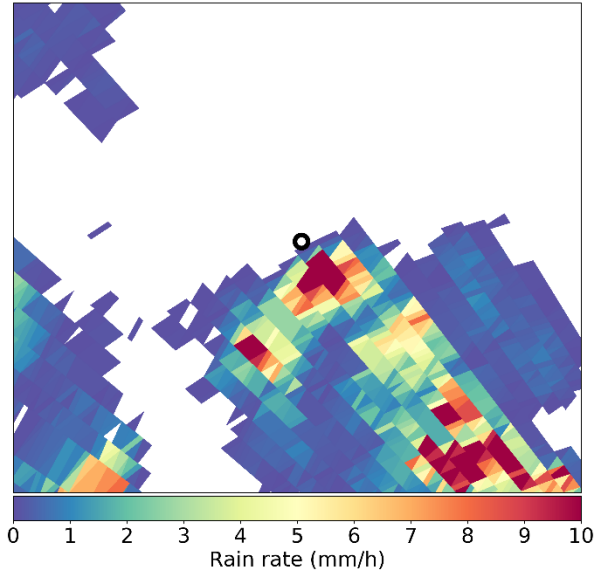


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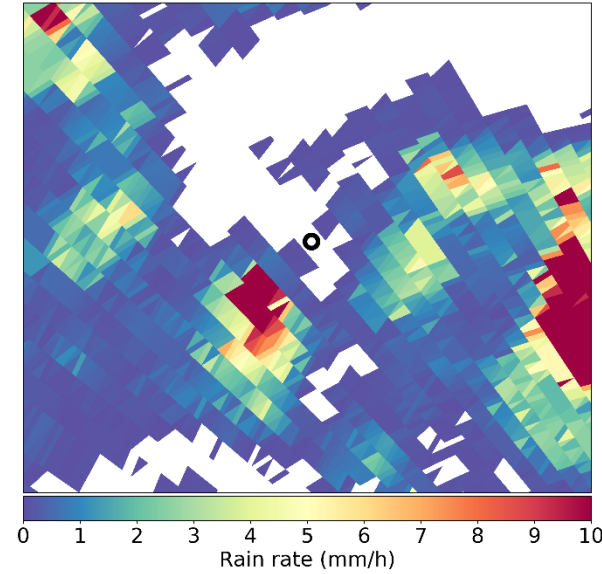
Kuusiku SUR 2016-09-03 09:00 UTC



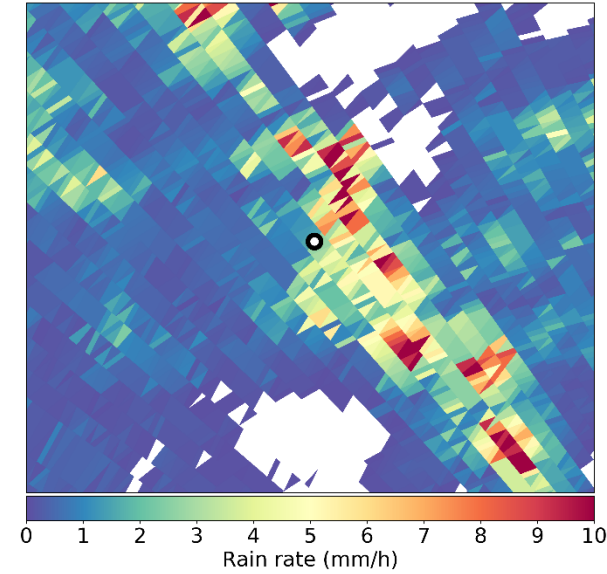
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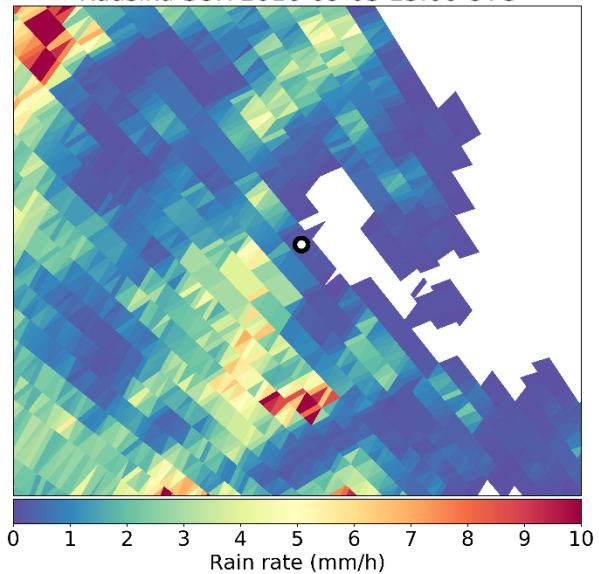
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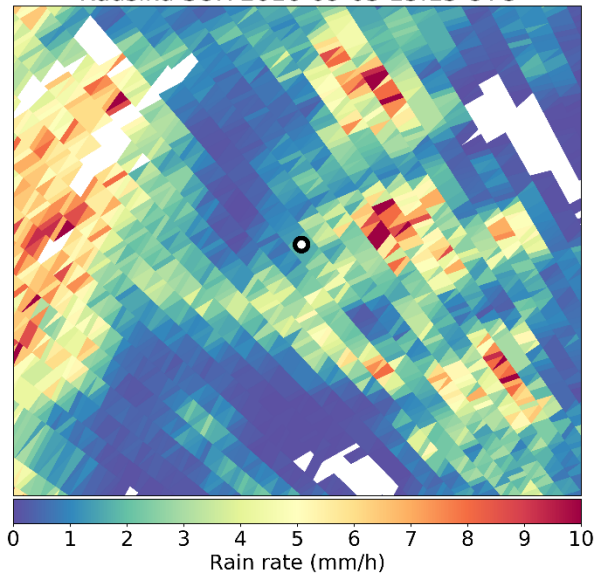
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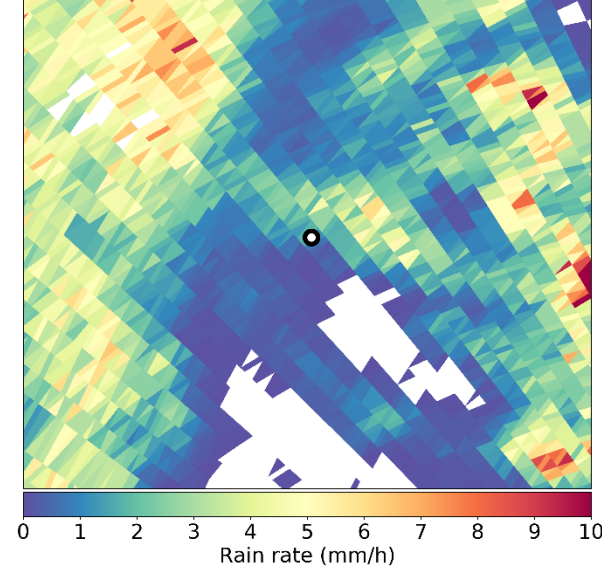
Kuusiku SUR 2016-09-03 13:00 UTC



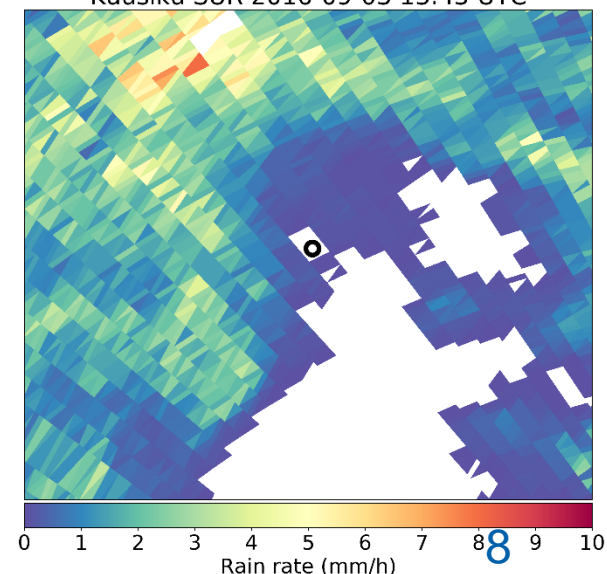
Kuusiku SUR 2016-09-03 13:15 UTC



Kuusiku SUR 2016-09-03 13:30 UTC



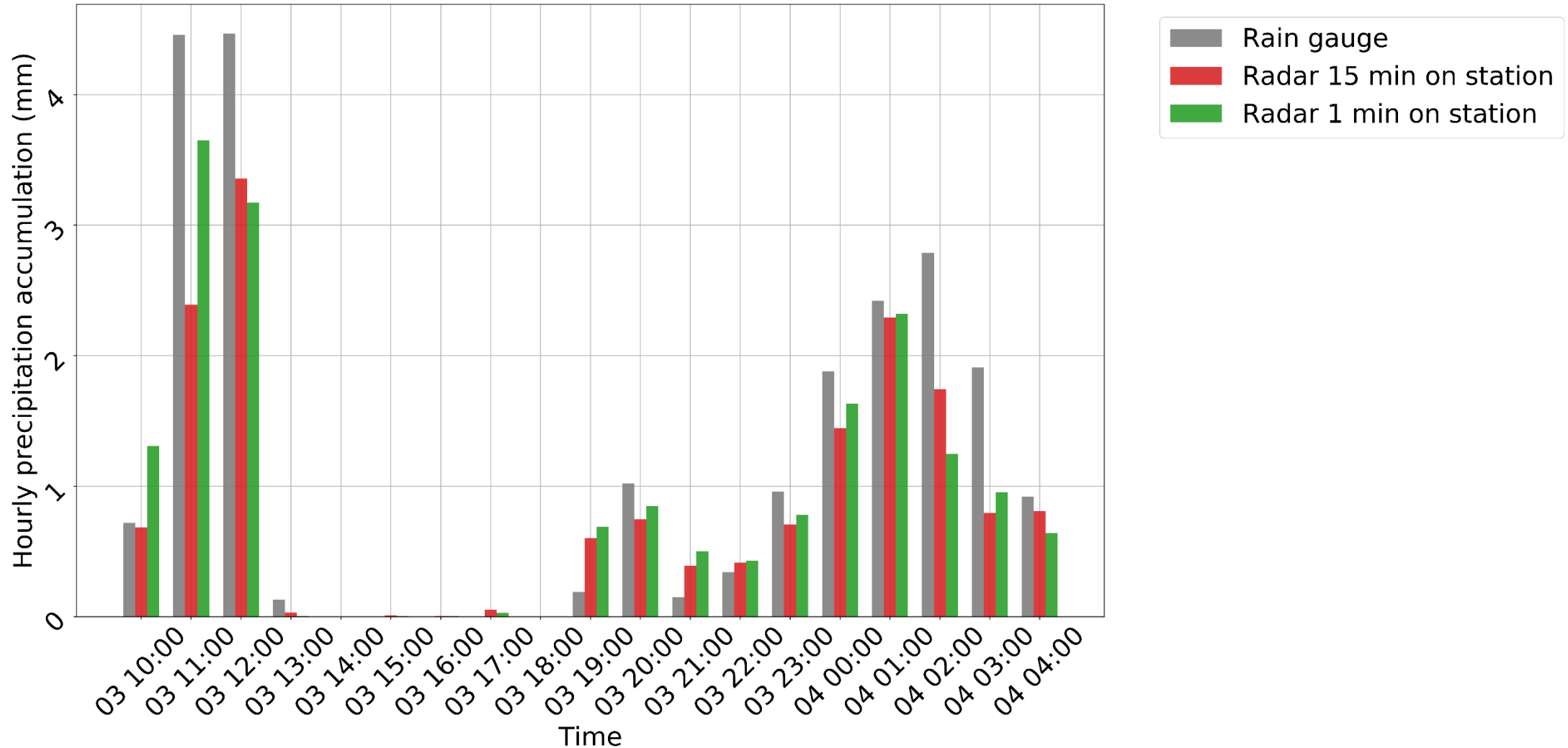
Kuusiku SUR 2016-09-03 13:45 UTC



Rain gauge and radar data comparison (3/3)

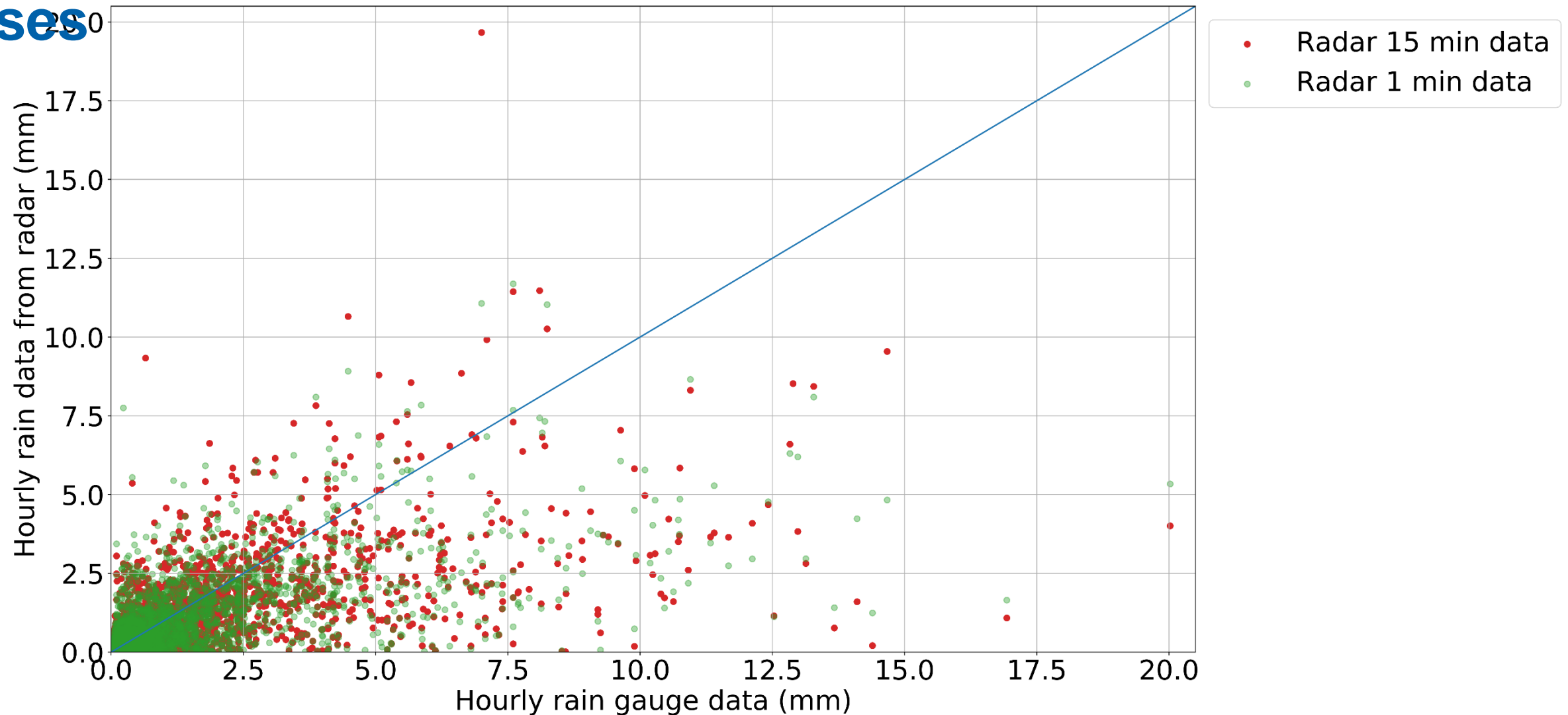
Nimbostratus case

Türi 2016-07-03 - 2016-07-04



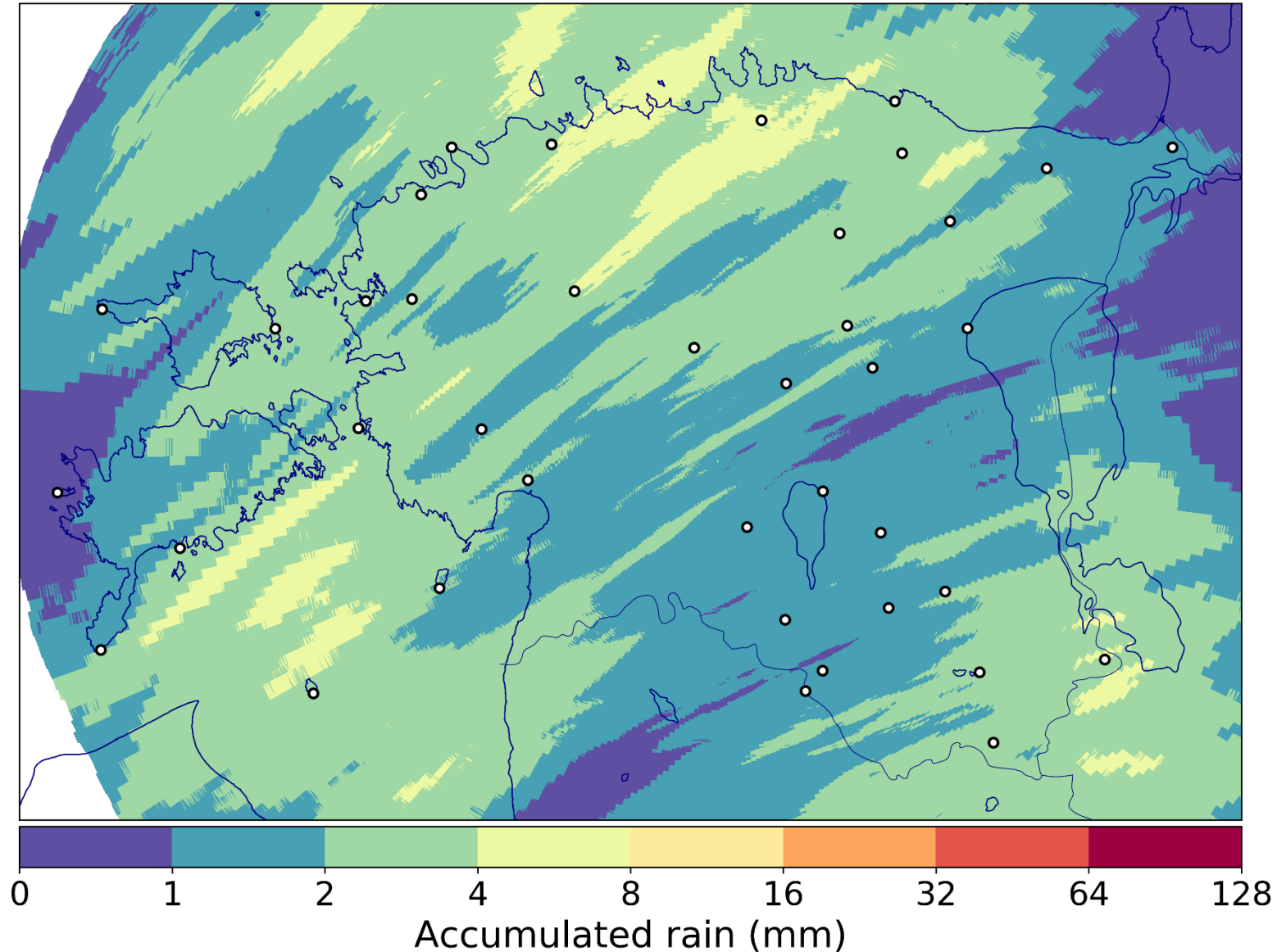


Hourly rain gauge and radar data comparison for all cases



Accumulated precipitation map from radar data

1 min data 2015 07-08 03:00 - 07-08 14:00



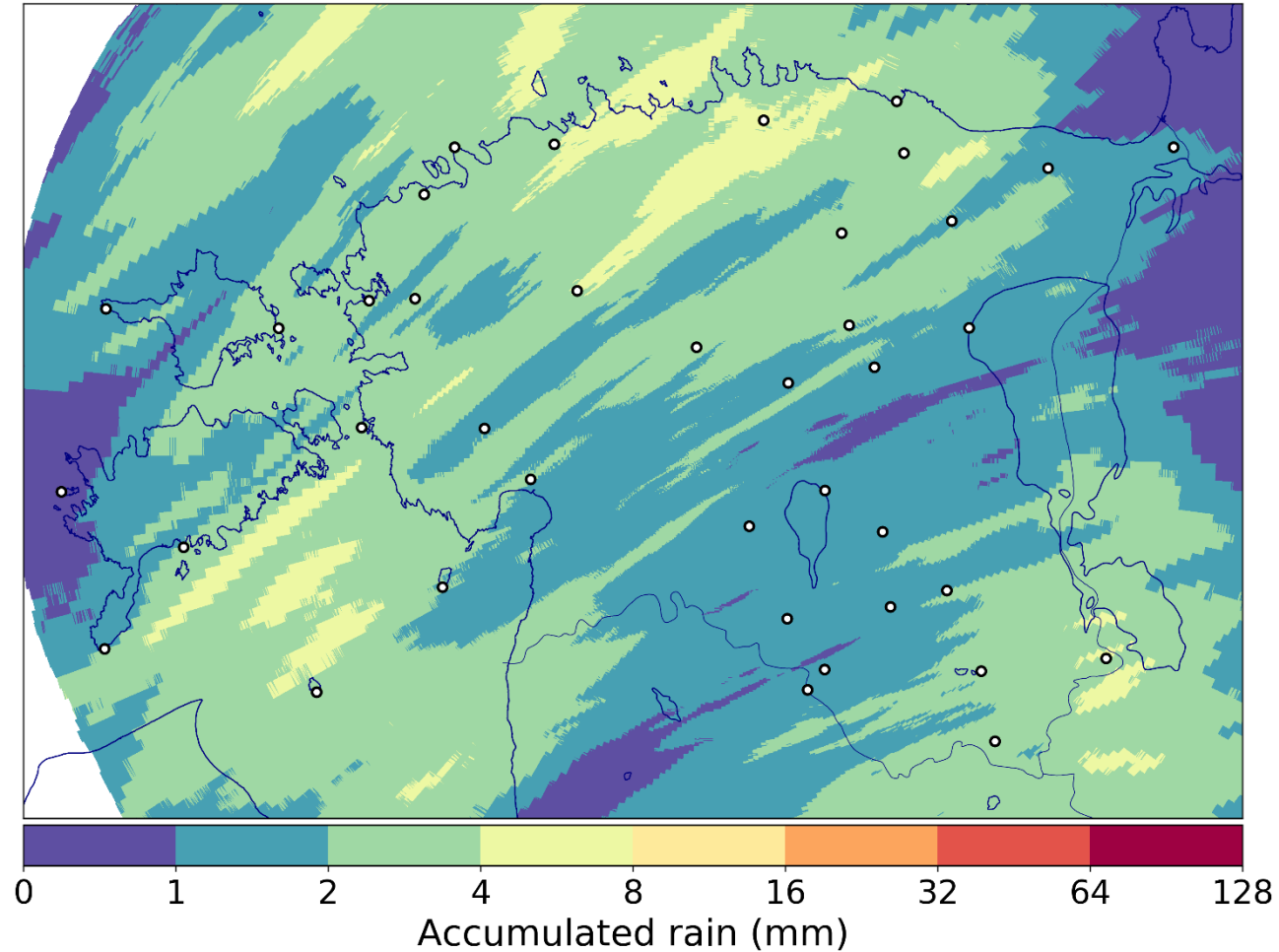
Accumulated precipitation map from radar data



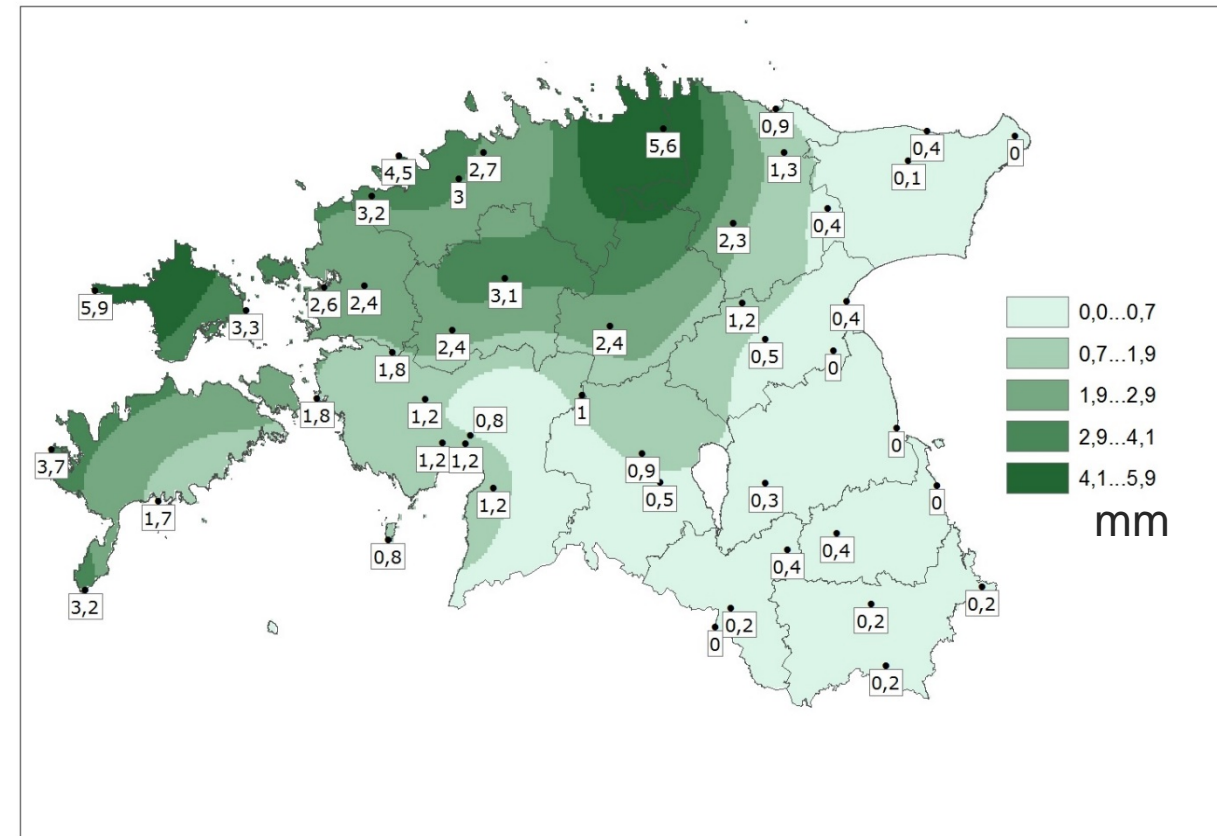
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data

1 min data 2015 07-08 03:00 - 07-08 14:00



Precipitation map from rain gauge data only

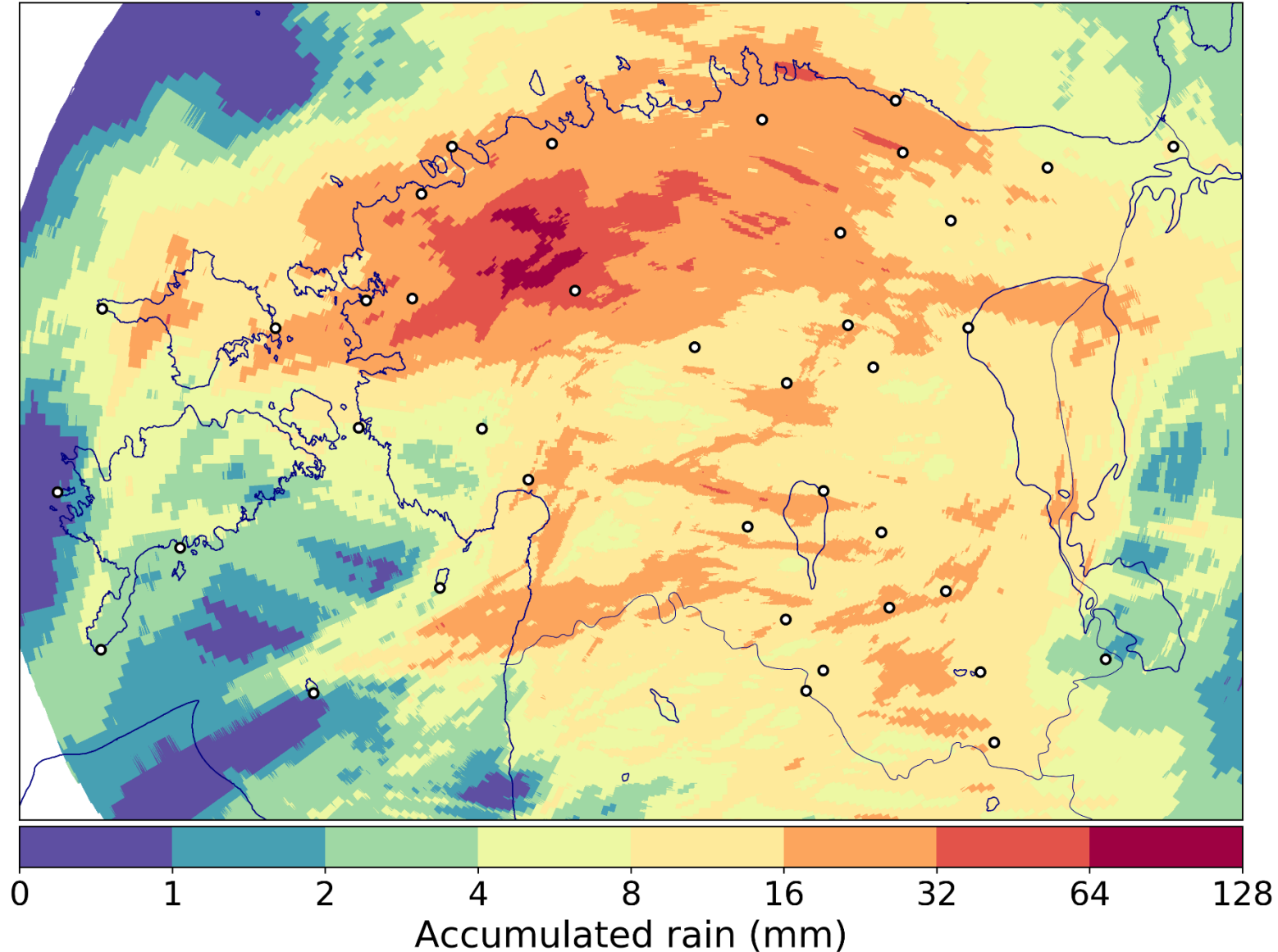


Accumulated precipitation map from radar data



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1 min data 2015 07-30 03:00 - 07-31 16:00



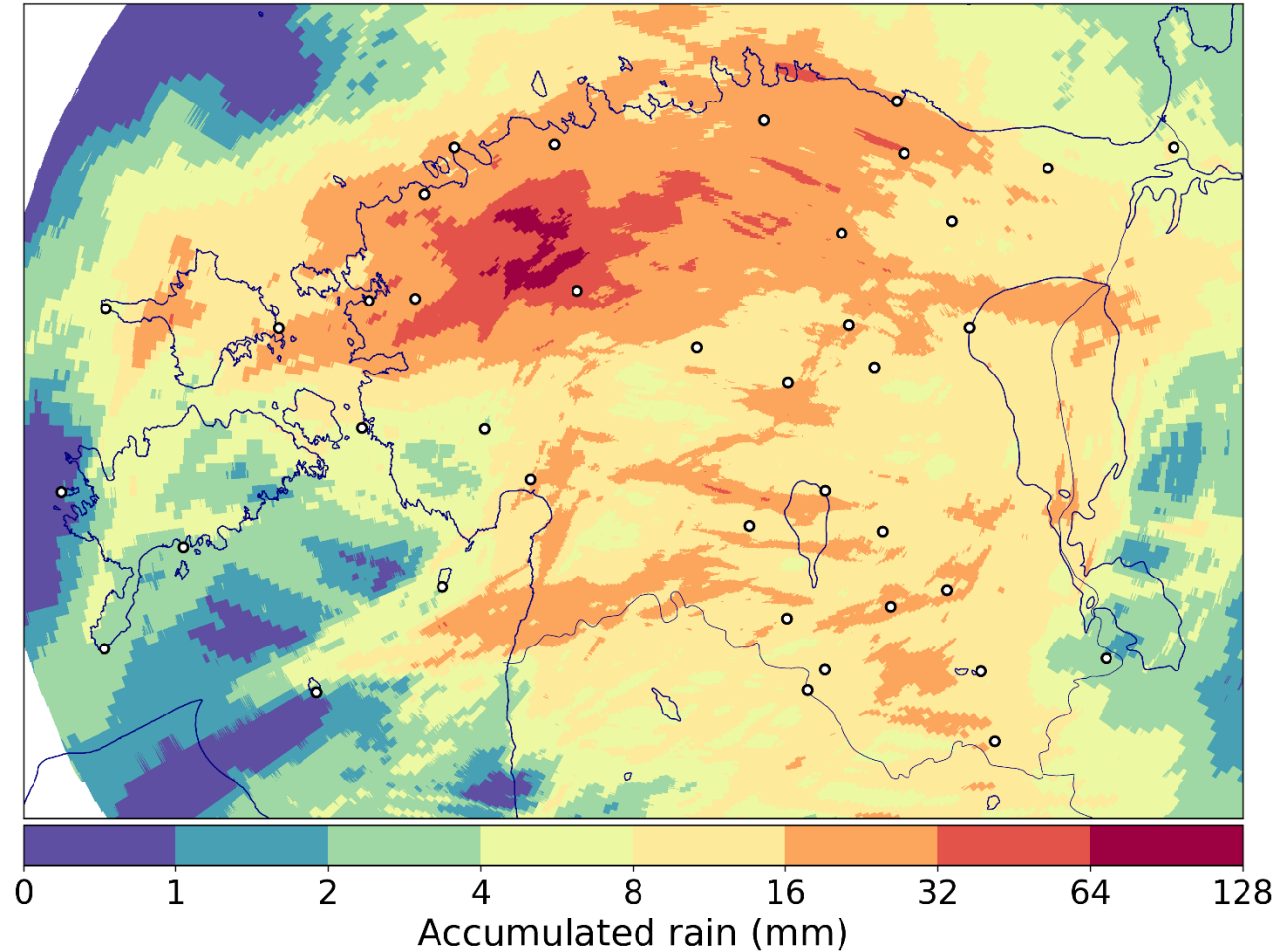
Accumulated precipitation map from radar data



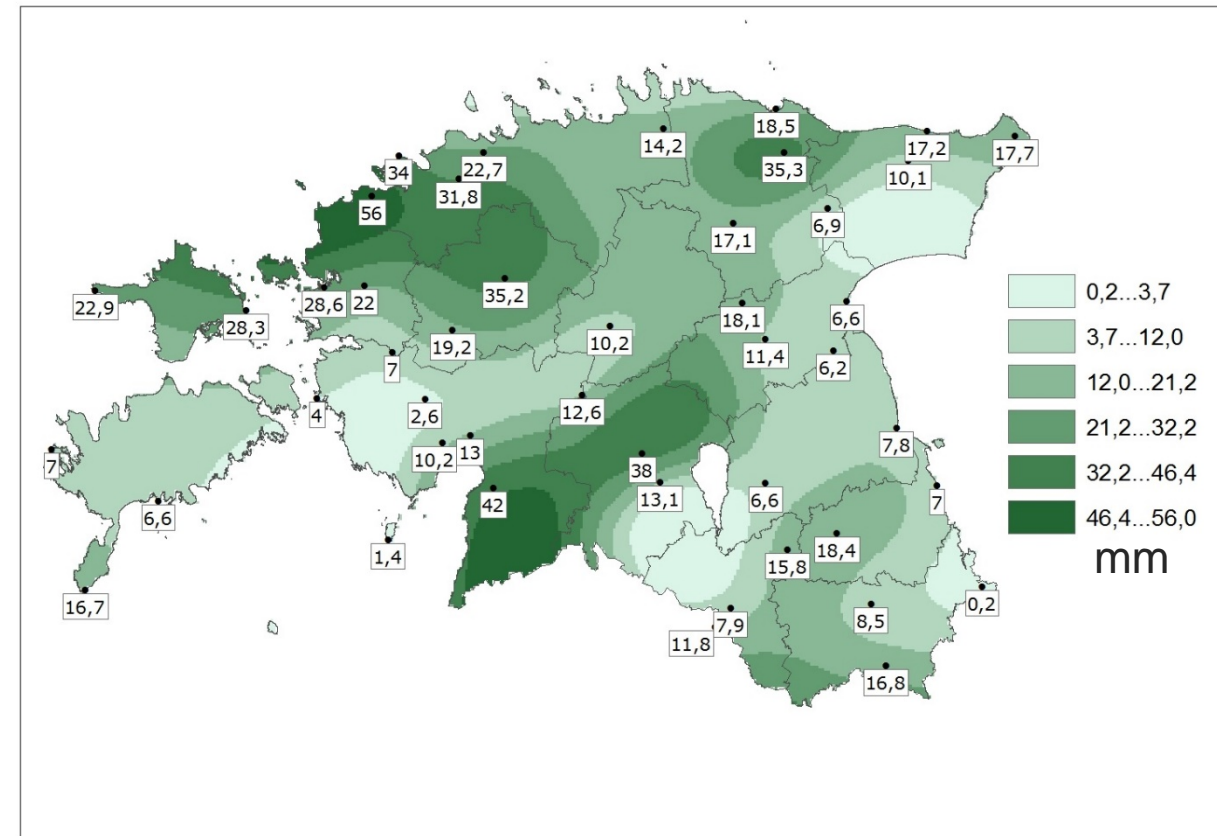
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data

1 min data 2015 07-30 03:00 - 07-31 16:00



Precipitation map from rain gauge data only

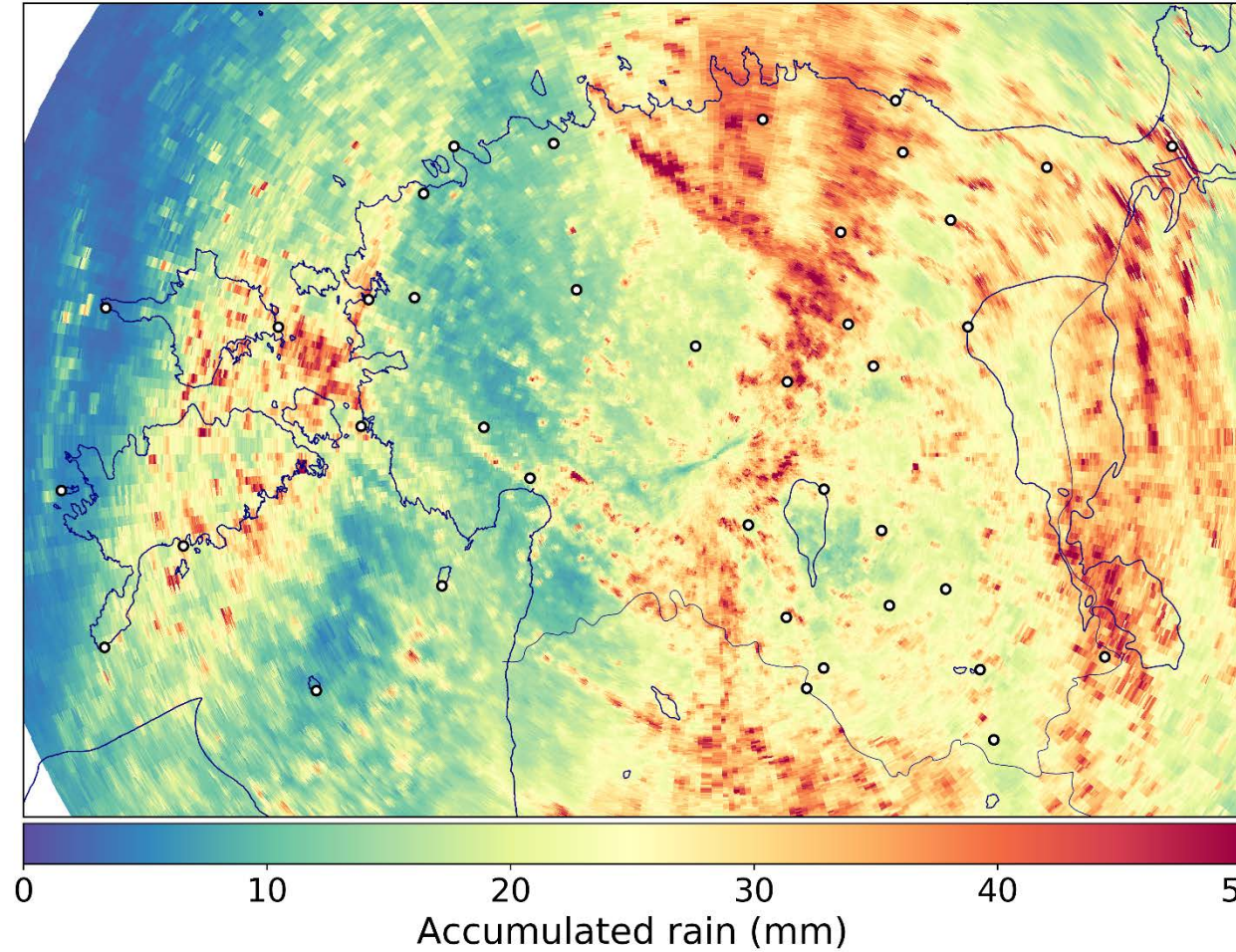


Accumulated precipitation map from radar data

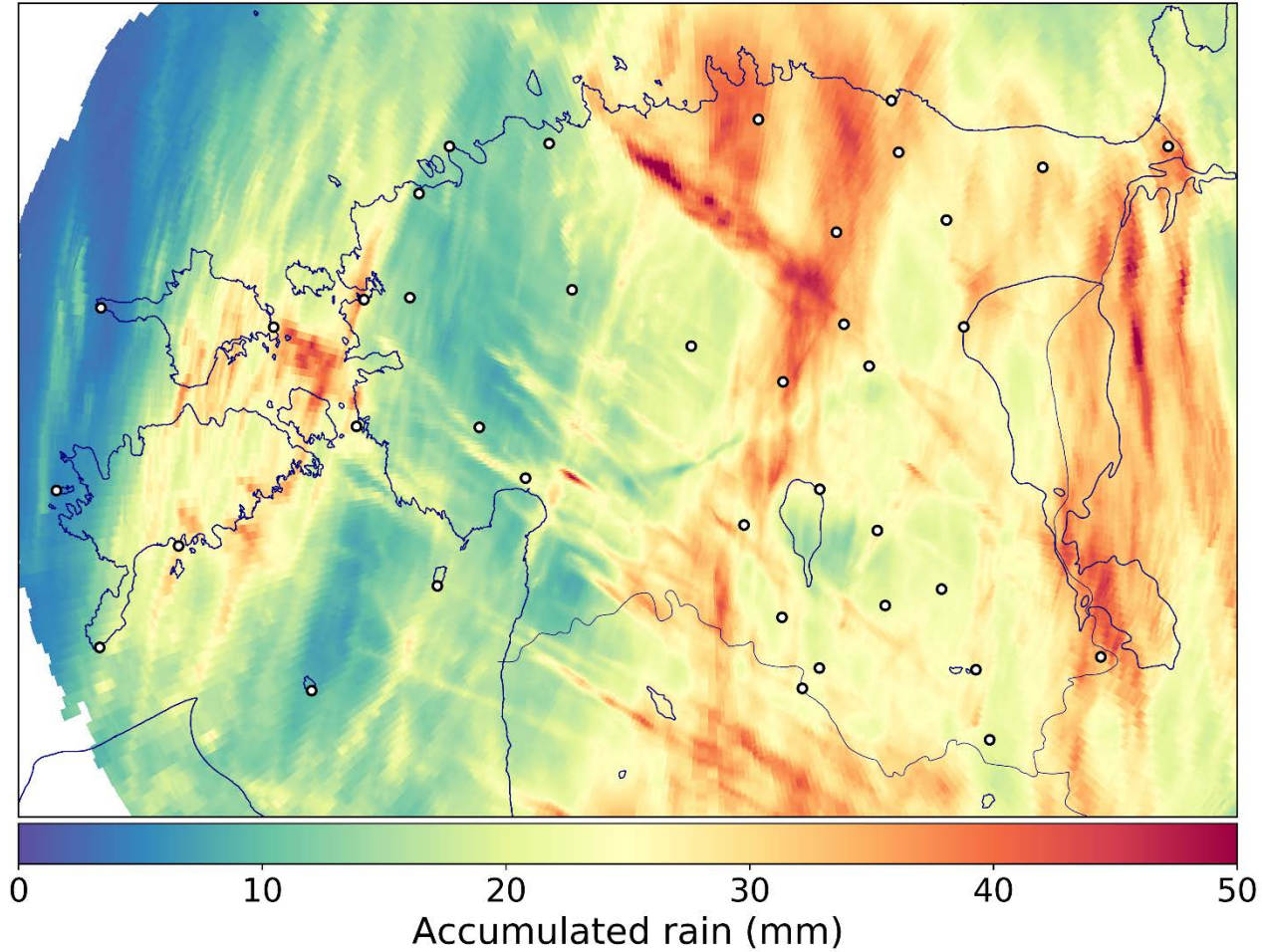


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15 min data 2016 07-02 10:00 - 07-04 22:00



1 min data 2016 07-02 10:00 - 07-04 22:00





Conclusions

- Estonia needs more rain gauges for better spatial estimation of precipitation
- Radars need to scan more frequently for better temporal estimation of precipitation

Summary

- Weather radar data was used to make better quantitative precipitation estimations
- Radar data was processed with optical flow method in order to enhance temporal resolution
- For shorter period the method is inefficient but precipitation maps are more realistic