



**University of Stuttgart**  
Institute for Modelling Hydraulic and  
Environmental Systems



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# Using Data From Personal Weather Stations to Improve Precipitation Estimation and Interpolation

Authors: **Ándras Bárdossy**,  
Jochen Seidel,

**Abbas El Hachem**

EGU session: HS7.1

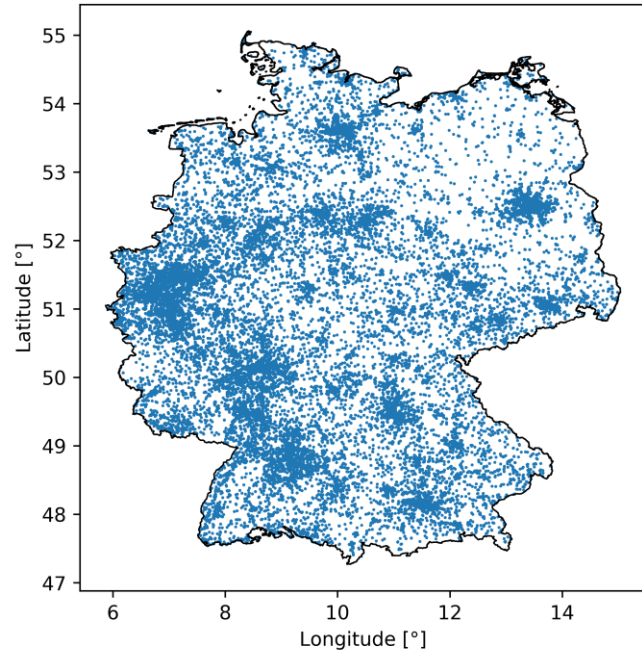
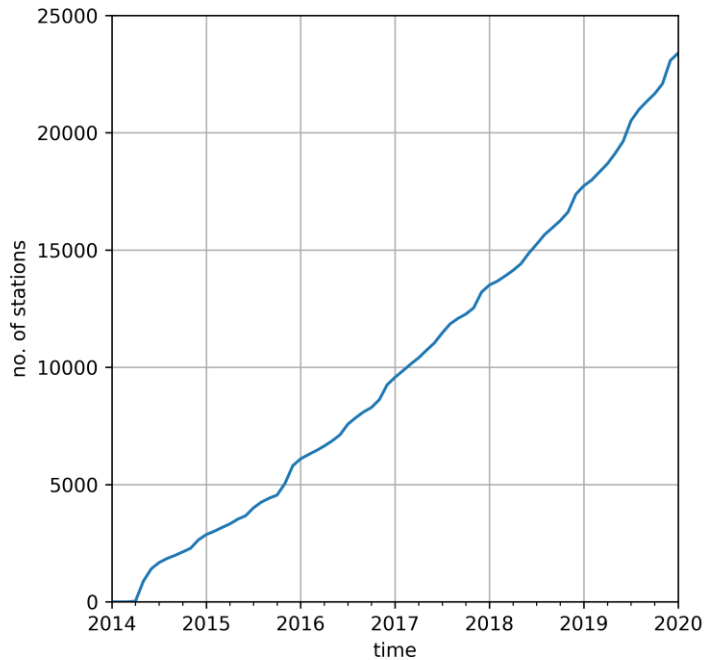
Email: [abbas.el-hachem@iws.uni-stuttgart.de](mailto:abbas.el-hachem@iws.uni-stuttgart.de)

# Ideas

1. Use Personal Weather Station (PWS) data for precipitation interpolation
2. Identify reliable PWS using a primary reliable network (DWD)
3. Correct bias in PWS data
4. Apply a spatial event based filter
5. Interpolate intense event and cross validate DWD station

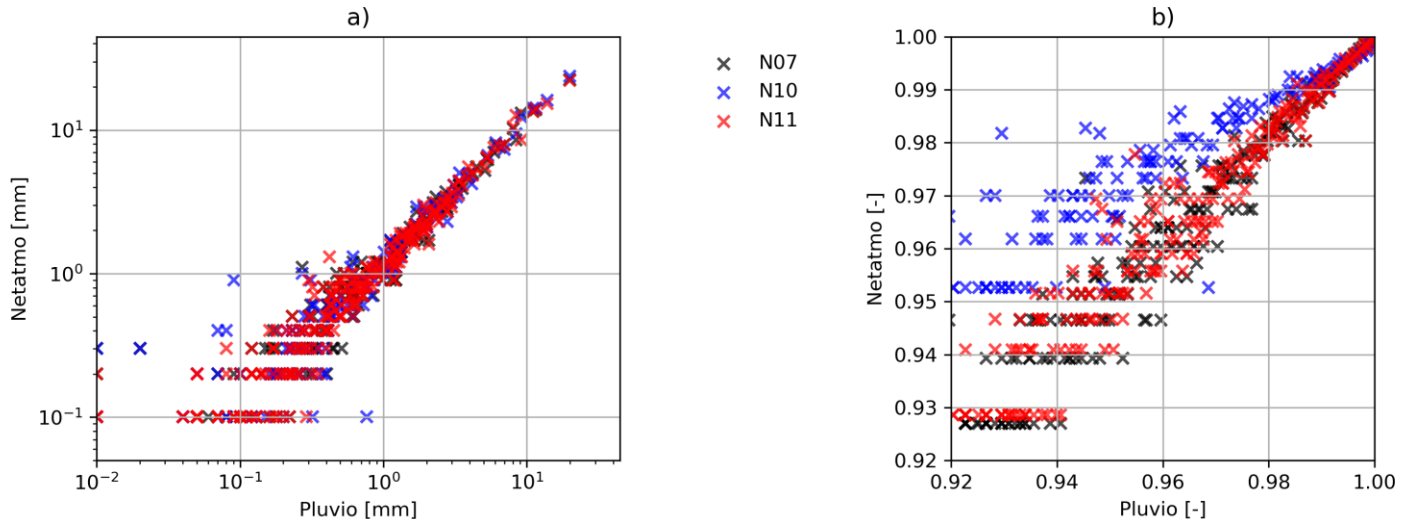
# 1. PWS - Netatmo

## Why Netatmo?



- High temporal resolution (5min data)
- Similar devices → hopefully similar behavior
- Public data

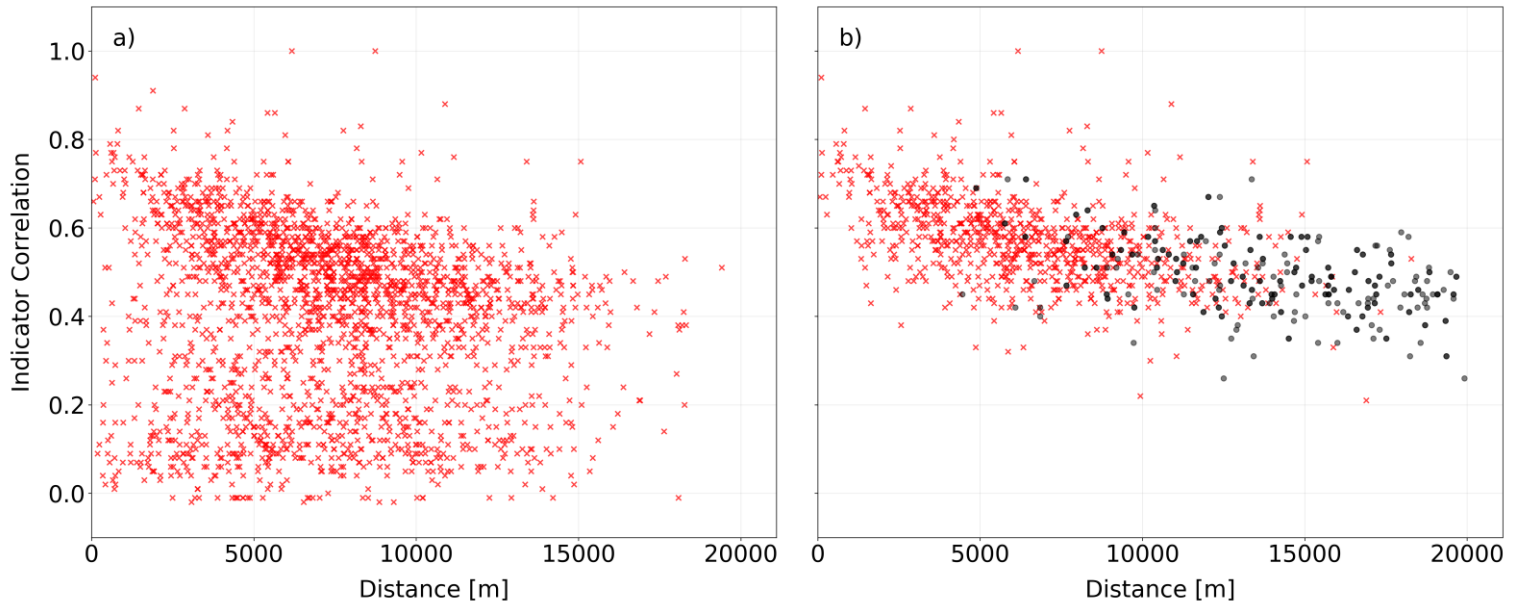
## 2. The Quantiles are more reliable, especially for high values



Scatter plot showing a) the hourly rainfall values (axes log-scaled) and b) the corresponding upper percentiles  $> 0.92$  (right).

- Basic assumption: the measured Netatmo data maybe biased in their values but are **good in their order** (at least for high precipitation amounts).

## 2. Indicator correlations for 1h temporal resolution and $\alpha = 0.99$

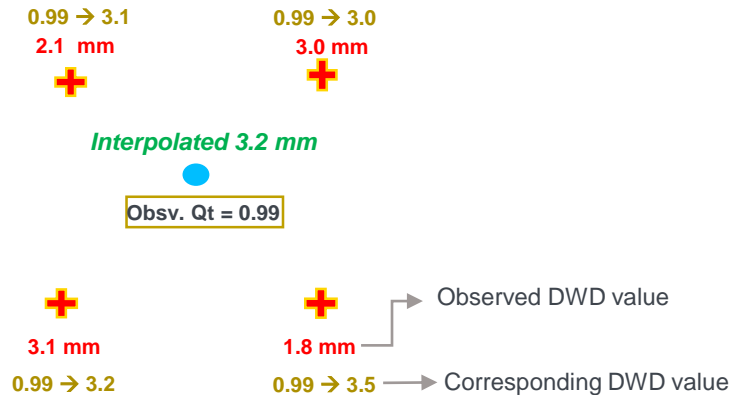


Calculated between the secondary network and the nearest primary network stations before (left) and after (right) applying the filter (red crosses). The black dots refer to the indicator correlation between the primary network stations.

# Example: Bias correction

● Netatmo Station: Observed rainfall 2.3 mm →  
Corresponding quantile = 0.99

✚ DWD Station: Using individual distributions find  
for the observed netatmo quantile the corresponding  
rainfall value.

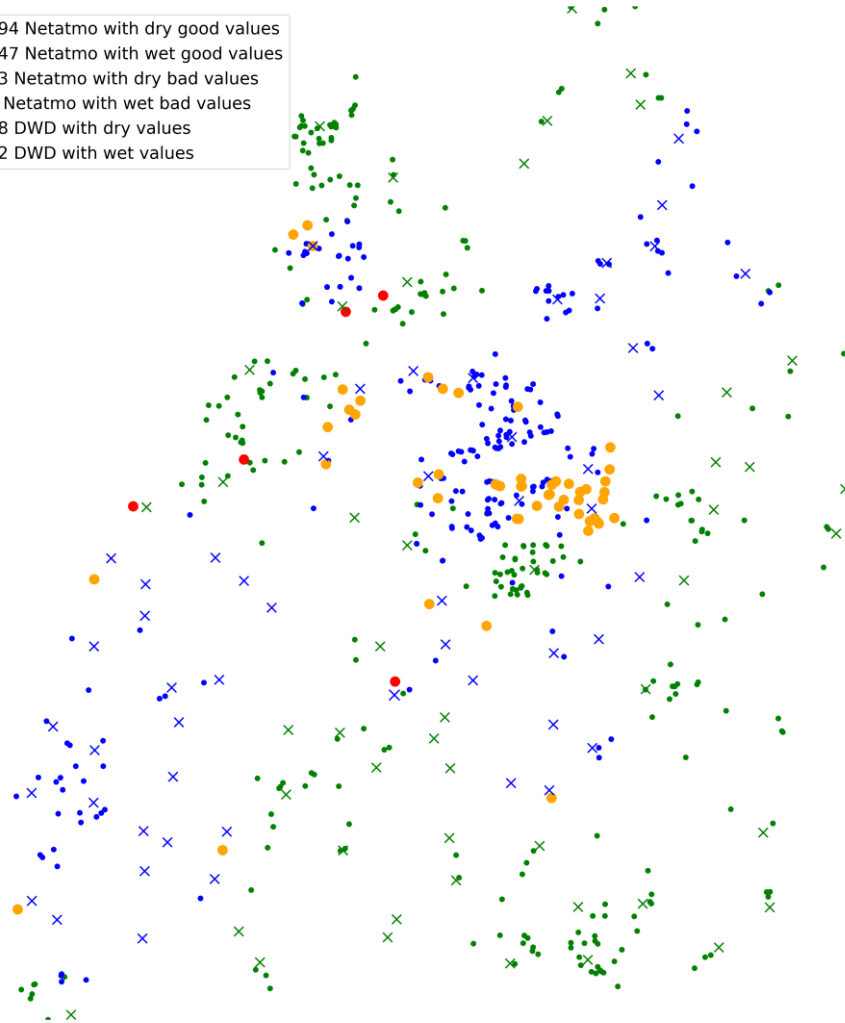


➤ Interpolated rainfall at Netatmo exceeds all observed values at DWD stations.

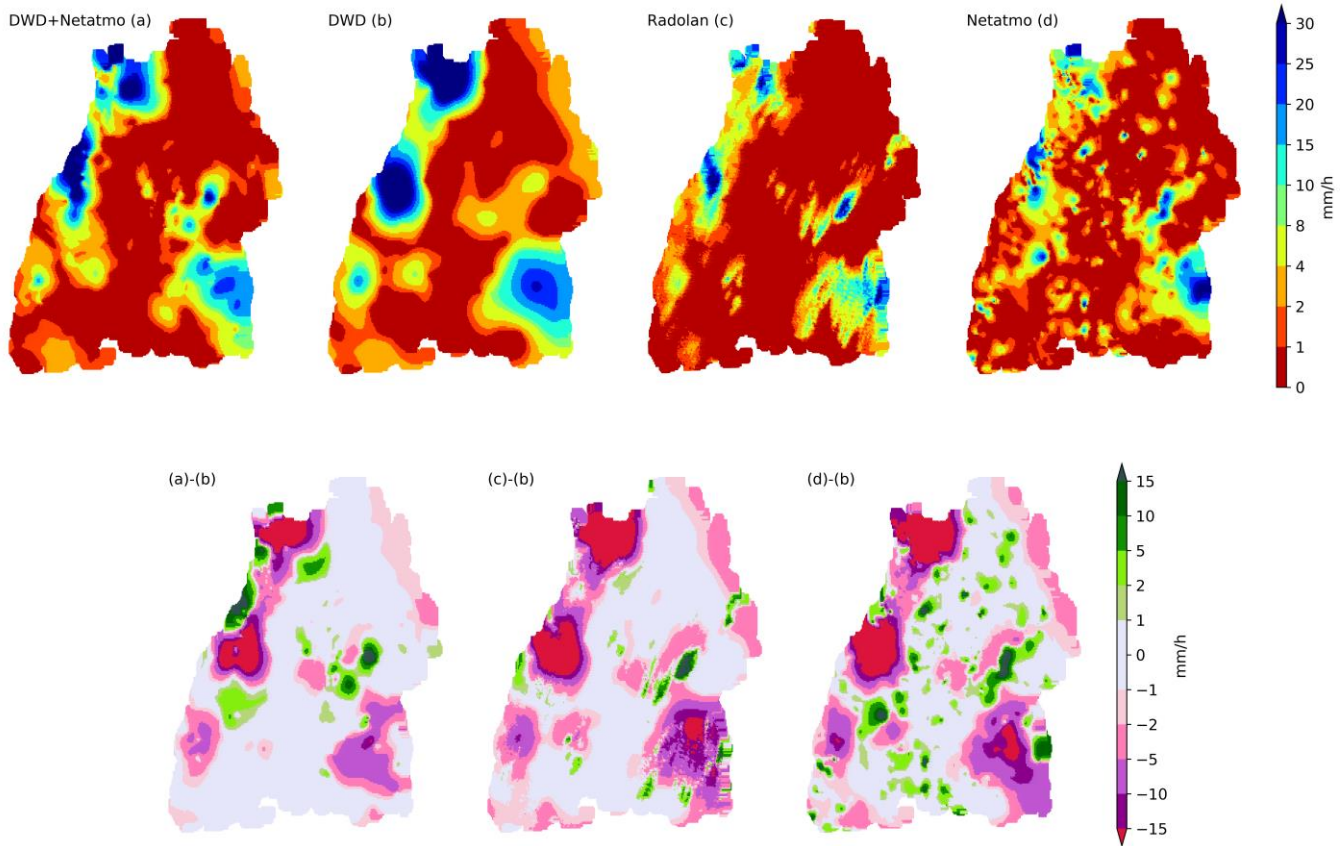
*Note: using direct rainfall values for interpolation leads to a value of 2.5mm*

## 4. On-event filter (11-06-2018 18:00:00)

- 294 Netatmo with dry good values
- 247 Netatmo with wet good values
- 53 Netatmo with dry bad values
- 5 Netatmo with wet bad values
- × 48 DWD with dry values
- × 52 DWD with wet values



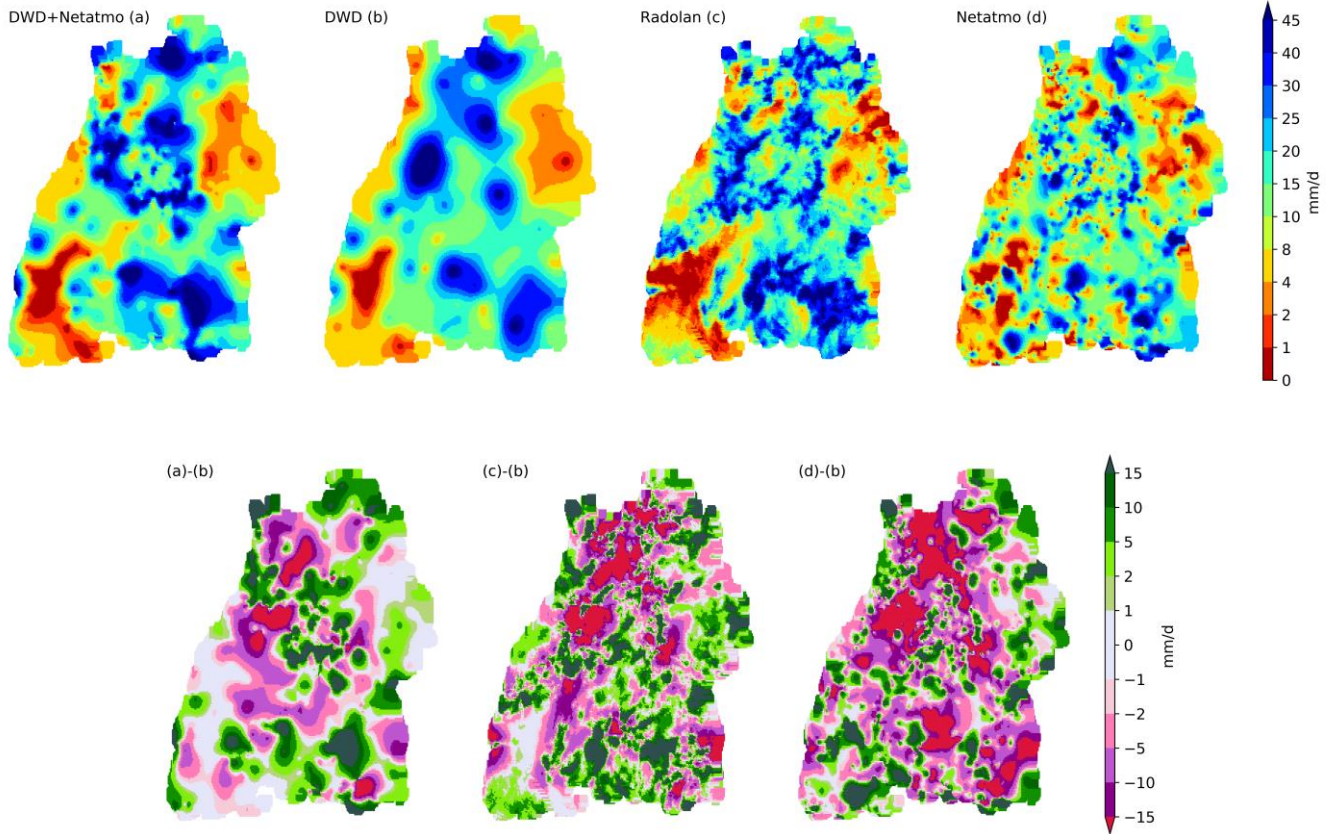
## 5. Interpolation of hourly event: 11-06-2018 from 15:00 till 16:00 pm



Note that for this event the cross validation based on the primary observations showed an improvement of  $r$  from **0.36** to **0.77**, of  $\rho$  from **0.55** to **0.76** and a reduction of the **RMSE** from **12.5** to **8.2**.



## 5. Interpolation of a daily event: 28-07-2019



Note that for this event the cross validation based on the primary observations showed an improvement of  $r$  from **0.32** to **0.75**, of  $\rho$  from **0.42** to **0.77** and a reduction of the **RMSE** from **14.71** to **10.2**.

# Thank You!

Questions or comments?



## Complete Paper:

Bárdossy, András & Seidel, Jochen & El Hachem, Abbas. (2020). The use of personal weather station observation for improving precipitation estimation and interpolation. [10.5194/hess-2020-42](https://doi.org/10.5194/hess-2020-42).