Error assessment of precipitation products based on the elevations and extreme events

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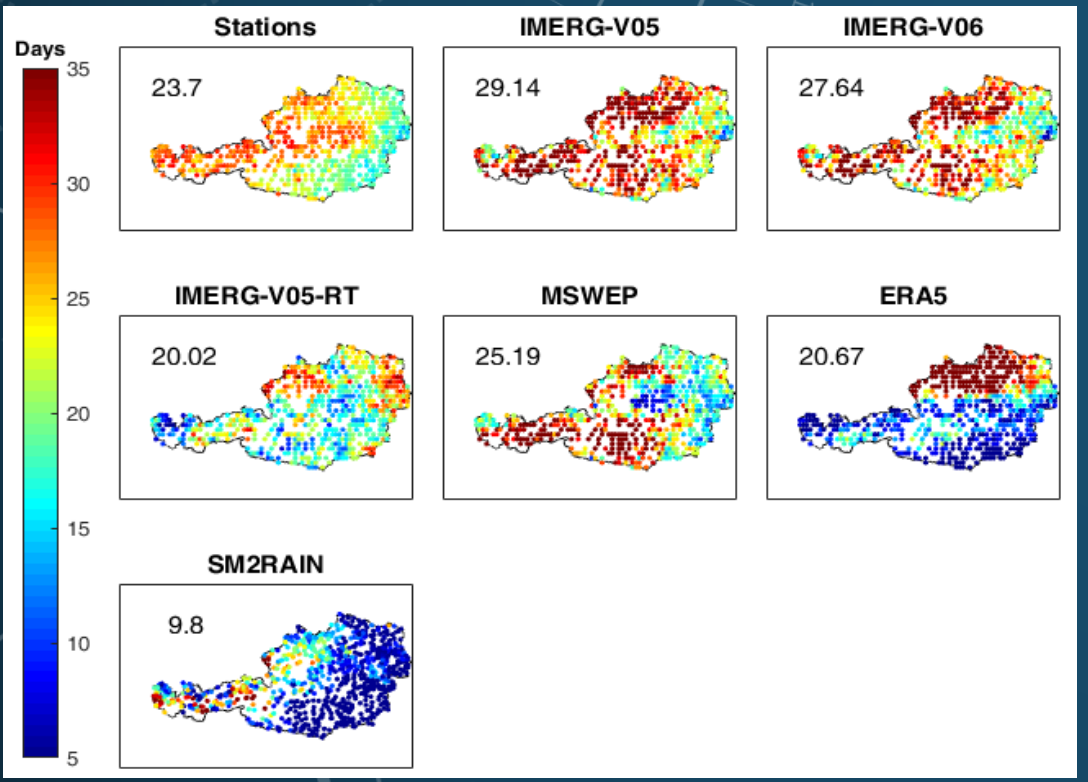
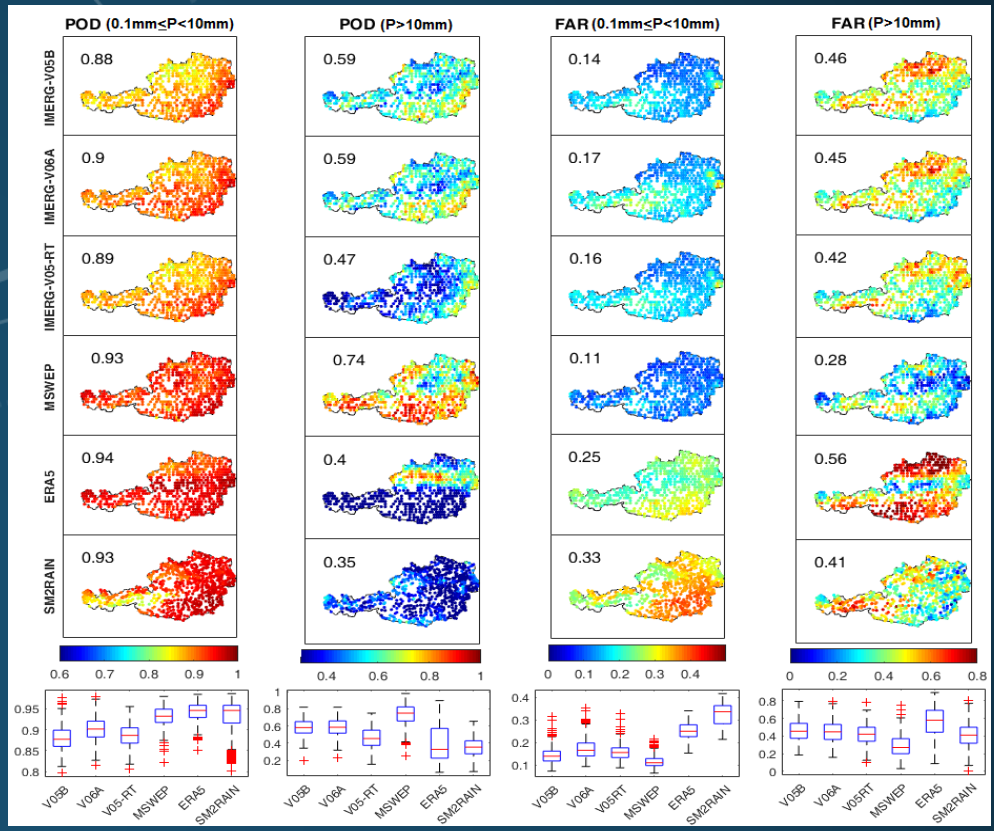
To elucidate the strengths and weaknesses of recently released gridded precipitation datasets, we conducted a comprehensive evaluation of the performance of IMERG-FR-V05B, -V06A, IMERG-V05B-RT, ERA5, SM2RAIN-ASCAT, and MSWEP-V2.2 at daily and monthly time-scales for Austria using a dense network of gauges (882 stations) as a reference. The evaluation was carried out based on continuous and categorical statistical metrics for the period June 2014–December 2015.

- For the heavy precipitation category (P >10 mm), MSWEP and ERA5 products were found as the most and less powerful products to detect precipitation with the average value of 0.74 and 0.28 for MSWEP and 0.4 and 0.56 for ERA5 with respect to POD and FAR values over the area. Compared to other products, ERA5 indicated more complex spatial non-uniformity of POD and FAR.

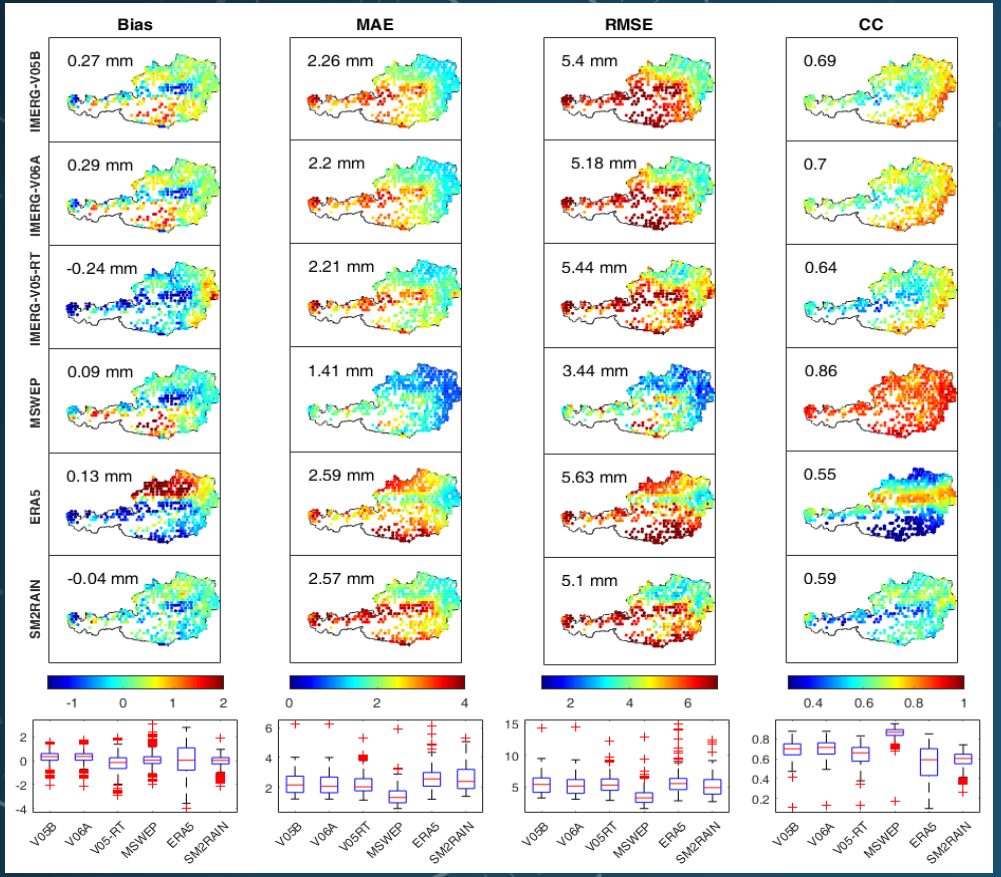


Distribution of daily R90th percentile of precipitation



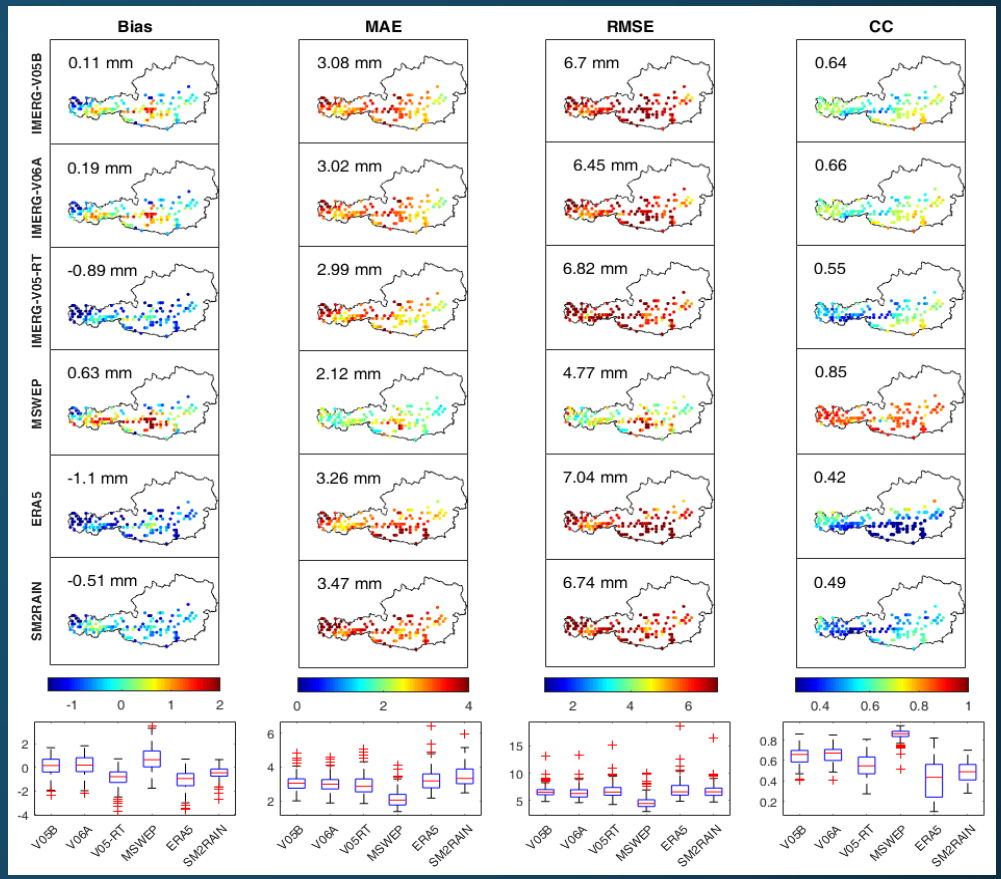
Spatial distributions and box-plots of POD and FAR at daily scale with respect to precipitation range of light-moderate (0.1 mm ≤ P < 10 mm) and heavy (P > 10 mm) events over Austria.

- However, the spatial mean value of R90th for MSWEP was closer to the stations. In contrast, ERA5 underestimated extreme events over large part of the south of the country, while showing higher number of extremes over north Austria. Moreover, SM2RAIN, underestimates the R90th, almost over the entire country, except for some parts over the western region



Spatial distributions and box plots of the statistical indices for the precipitation products and stations with the elevation equal or less than 1000 m.

- According to the elevation categories, MAE and RMSE evaluation metrics showed almost similar skills for all products, while a sharp contrast between the east and west of Austria with respect to both elevation categories is observed, except for MSWEP, which indicated gradual variation.
- With respect to CC, MSWEP performed well, followed by IMERG-V05B and -V06A over the whole region, while ERA5, SM2RAIN, and IMERG-V05-RT showed weak CC, respectively, particularly over the alpine valleys.



Spatial distributions and box plots of the statistical indices for the precipitation products and stations with the elevation greater than 1000 m.

- According to the analysis of the considered products, MSWEP-V2.2, followed by IMERG-V06A and -V05B, are the most suitable for driving hydro-meteorological, agricultural, and other models over mountainous terrain.
- The robustness of MSWEP may be rooted in applying the daily gauge corrections for MSWEP.

Reference: **https://doi.org/10.3390/rs11172018**