Validation of reconstructed hydroclimate variables for past drought assessment

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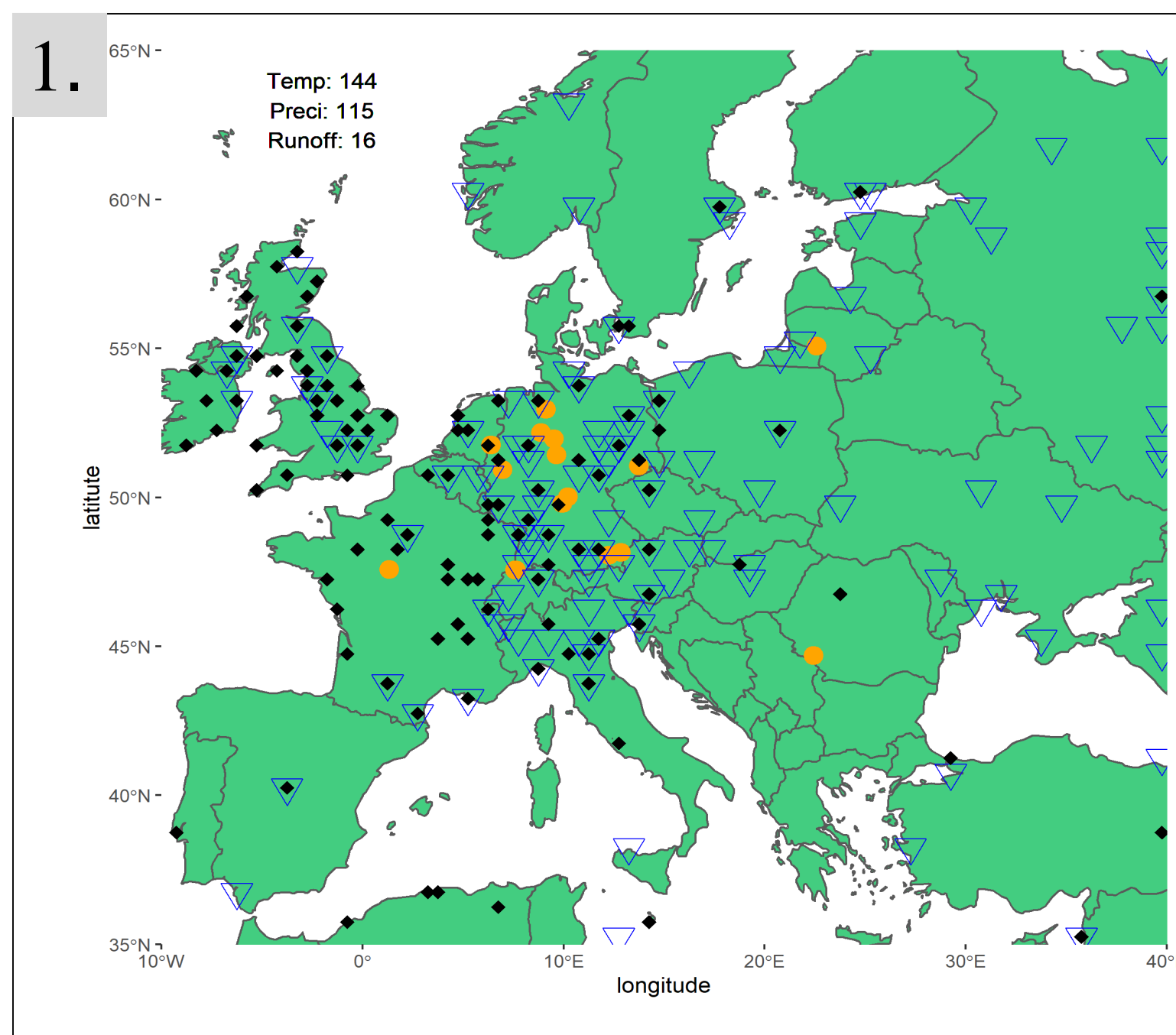
Abstract In present paper, we compare the reconstructed gridded seasonal precipitation (P) and temperature (T) for Europe [1,2] to the available station data from the GHCN [3] network dated back to 1800. The basic statistical properties at various time-scales ranging from 1/4 to 30 years are examined. Our finding shows, that there are significant biases clearly seen in the reconstructed P and T and the bias in mean and variability considerably vary over the time-scales. We further investigated how the simulation of hydrological model driven by reconstructed data compares to that based on station data and runoff from GRDC database[4]. The results are validated and a reconstruction back to 1500 is provided. Similarly the Standardized Runoff index are determined for all available GRDC station[4].

References

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The assessment of European droughts are limited to short term record (until 20th century), a long and reliable paleoclimate reconstruction is important to gain understanding of past climate and droughts.
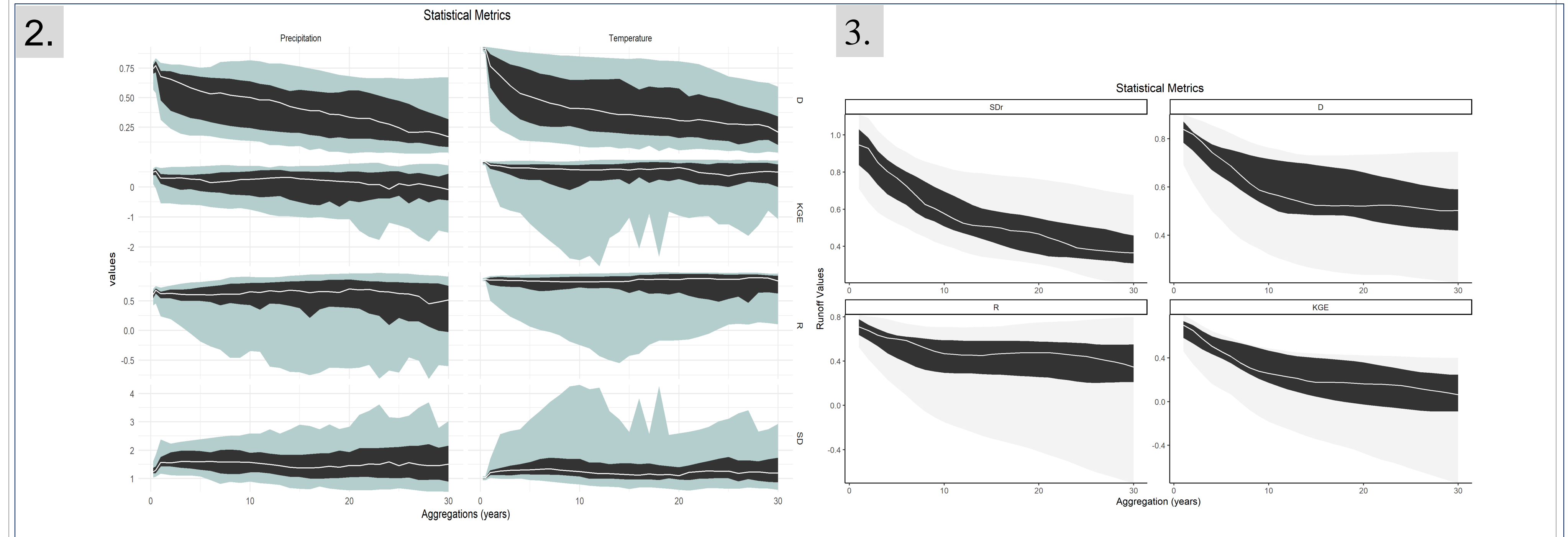
The error in variance (SD), index of agreement (D), correlation (R) and Kling-Gupta efficiency(KGE) for the paleoclimate reconstruction of precipitation, temperature and runoff demonstrates with respect to observational [P,T] GHCN-m[3] and simulated runoff driven by GR1A model are shown in figures 2-3.
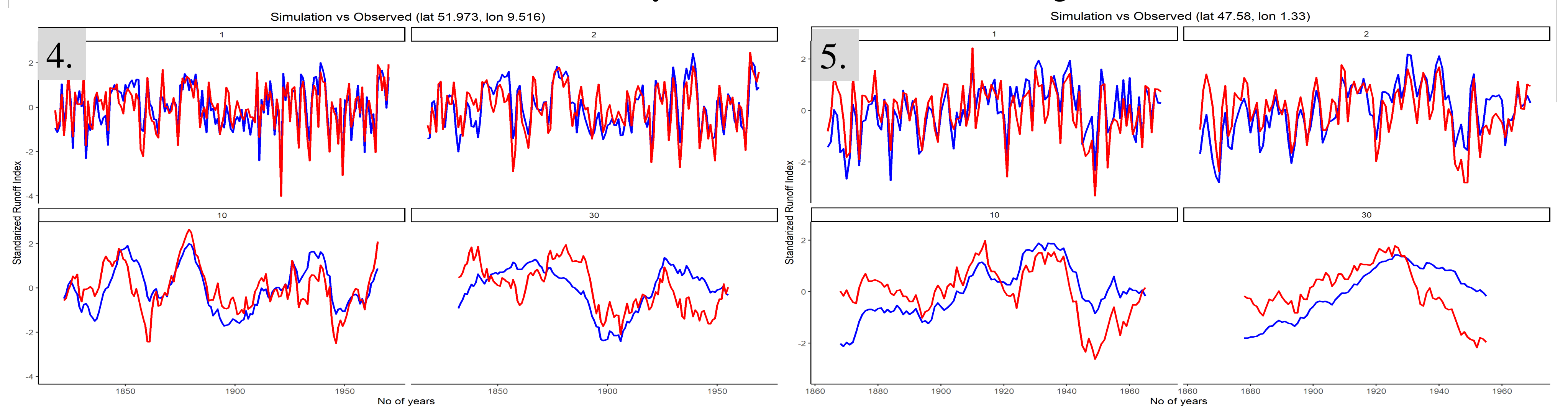
Standardized Runoff index (SRI) for 1, 2, 10 and 30 years aggregations show good match between the GR1A model simulation [4] and observed runoff for catchments in Germany and France (figure 4,5), some are worst (not shown).
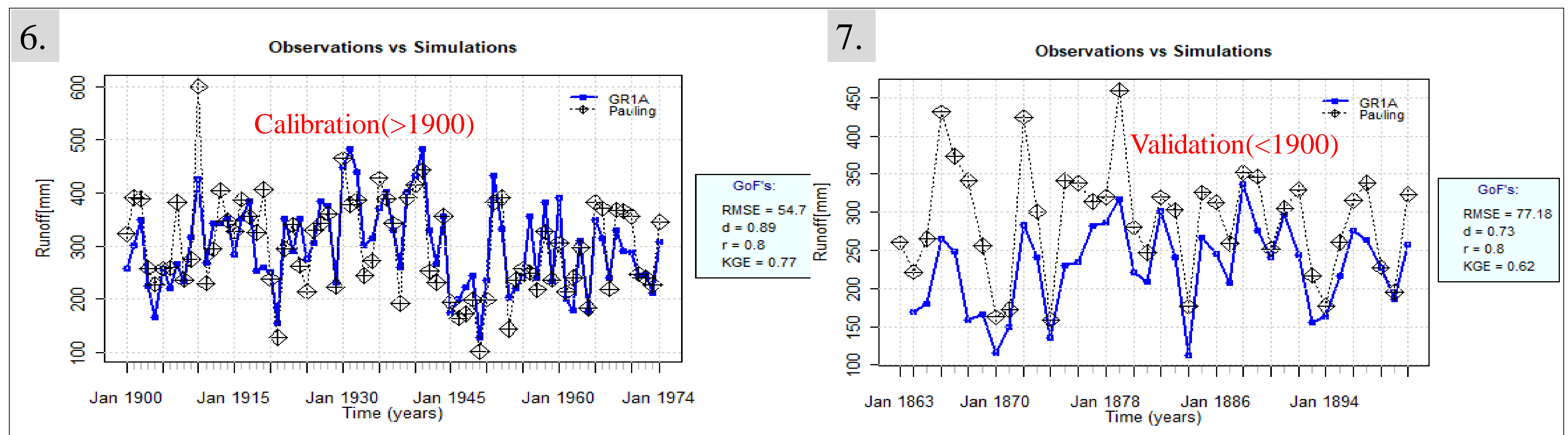
Summary

✓ While the agreement of reconstructed precipitation and temperature with observations is at most sites reasonable at seasonal to annual time-scale it typically gets much worse for longer aggregations.

✓ In particular, the variability of precipitation is underestimated at all time scales

✓ While the hydrological model (GR1A) is able to reproduce observed runoff in the calibration period (post-1900), the validation on independent (pre-1900) data shows significant discrepancies

✓ Our results show that the reconstructed precipitation and temperature data can be used for drought assessment only with caution