Figure 8. Distribution of RMSE [mm/year] for infill of missing values for all catchments and years (1996-2005) when the target catchments are treated as ungauged (UG) in the cross-validation for the areal, centroid and Top-Kriging (TK) method. The lower and upper quartiles correspond to the first and third quartiles (the 25th and 75th percentiles), and the whiskers extend from the quartiles no further than 1.5 · IQR, where IQR is the distance between the first and third quartile. The same applies for all boxplots presented in this paper.

Figure 9. Distribution of RMSE [mm/year] for infill of missing values for all catchments and years (1996-2005) for the areal model, centroid model and for Top-Kriging (TK) when the target catchments are treated as partially gauged (PG), i.e. a short record of length one from the target catchment is included in the observation likelihood in the cross-validation. Results for linear regression (LR) are also included here.

pattern like this, with $\sigma_c \gg \sigma_x$ and $\rho_c < \rho_x$, suggests that the information gain from neighboring catchments further away is low for an ungauged catchment, and that the potential information stored in short records is high.

For January however the situation is different: The posterior mode of $\sigma_x$ is larger than the posterior mode of $\sigma_c$ for both the areal and the centroid model. The parameters show that for January, year-specific effects explain a larger part of the spatial variability. This can be due to a more unstable hydrological setting with runoff driven by snow accumulation and snow melt. For April, we have that $\sigma_c > \sigma_x$, but $\sigma_c$ is less dominant than for June and for the annual data.

In the areal and centroid model, the inclusion of a short record changes the climatic spatial field $c(u)$, and hence the predictions can be considerably changed for the target catchment if the climatic effect is strong. The parameter values thus suggest that the gain of including short records is lower for April and January compared to the other two datasets. This is confirmed by comparing the RMSE and CRPS for the areal and the centroid model for the partially gauged case (PG), to the RMSE and CRPS obtained for the ungauged case (UG) in Table 1. For all datasets, the RMSE and CRPS for our two models