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Kalman filter integrated with neural network for bias correction of WRF downscaled land surface temperature

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Land Surface Temperature (LST) is an important climate variable, related to surface energy balance and integrate thermal state of the atmosphere within the planetary boundary layer. LST is a key parameter in land surface processes and extensively used as inputs into assimilation routines to help improve the estimate of model state. In this study, the latest Weather Research and Forecasting model is used with the Advanced Research WRF (ARW) dynamic core for downscaling of LST. Kalman algorithm was used for the filtering and smoothing, while for bias correction of LST, artificial neural network (ANN) was implemented. For optimization Conjugate Gradient and Nelder-Mead methods were used. For performance assessment, Root Mean Square Error (RMSE) and %Bias were utilized in this study. The performance statistics revealed values of -3.30 (%Bias) and 0.0112 (RMSE) for Nelder-Mead, while for Conjugate Gradient values of -4.82 (%Bias) and 0.0116 (RMSE) were reported, which indicates that the performance of Nelder-Mead was much better than the Conjugate Gradient. The overall results indicated that after Kalman and ANN implementation, the biases in the LST was reduced as compared to the original non bias-corrected product and hence can be used for practical applications with less uncertainty.