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Fidelity of CORDEX Evaluation runs under Non-stationary climate

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The downscaling approaches: Statistical and Dynamic, developed for regional climate predictions, have both advantages and limitations. The statistical downscaling is computationally inexpensive but suffers from the violation of the assumption of stationarity in statistical (predictor-predictand) relationship. The dynamical downscaling is assumed to take care of stationarity but suffers from the biases associated with various sources. Here we propose a joint approach of both the methods by applying statistical methods: bias correction & statistical downscaling to **Coordinated Regional Climate Downscaling Experiment (CORDEX)** evaluation runs. The evaluation runs are considered as perfect simulations of CORDEX Regional Climate Models (RCMs) with the boundary conditions by ERA-Interim reanalysis data. The statistical methods are also applied to ERA-Interim reanalysis data and compared with observation data for Indian Summer Monsoon characteristics. We evaluate the ability of statistical methods under the non-stationary environment by taking the difference of years close to extreme future runs (RCP8.5) as warmer years and preindustrial runs as cooler years. We find statistical downscaling of CORDEX evaluation runs shows skill in reproducing the signal of non-stationarity. The study can be extended methods by applying statistical downscaling to CORDEX RCMs with the CMIP5 boundary conditions.