Seasonal Variations in Forecast Skill of NOAA CFSv2 Operational and CWRF downscaled Predictions over the CONUS

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The NOAA Climate Forecast System version 2 (CFSv2) provides operational seasonal forecasts that are downscaled using the regional Climate-Weather Research Forecasting (CWRF) model. This study evaluates the performance of temperature and precipitation predictions from 2012-2023 over the contiguous United States (CONUS) for four seasons: MAM, JJA, SON, and DJF. Statistical skill scores such as inter-annual anomaly correlation (IAC), root mean square error, and mean bias are used for evaluation. The CFSv2 ensemble uses 5-day interval initializations starting January 1, 2012, while the CWRF ensemble uses the same initializations with two microphysics schemes. CFSv2 exhibits a systematic cold bias in 2-meter daily maximum temperature (TMAX) and a warm bias in 2-meter daily minimum temperature (TMIN) across most regions, except the northeastern areas. The CWRF reduces the cold bias in TMAX by 1-3°C, and the warm bias in TMIN by 0.5-1°C. Both models show a wet bias in precipitation over most of the CONUS, with a dry bias in southeastern states. The CWRF mitigates the wet bias but enhances the dry bias, except in JJA, where the wet bias worsens. The dry bias is most extensive in JJA and least in DJF. JJA temperatures have the highest prediction skills for both CFSv2 and CWRF. Overall, CWRF shows superior prediction skills in spring and comparable skills in other seasons relative to CFSv2 over the CONUS. This study enhances understanding of seasonal prediction skill differences, contributing to the improvement of systematic errors in these models.