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Reliable subseasonal-to-seasonal (S2S) forecasts are valuable to a wide range of end users from energy, water management, to agriculture sectors. Typically, S2S Operational forecasts, skill evaluation, and data-driven model development such as machine learning involve analyzing the anomaly fields, which are defined as deviations from a fixed climate period. However, this introduces a ‘trend anomaly’ due to the non-stationary climate statistics in a changing climate. In this work, we seek to understand how the temperature trend impacts S2S forecast tools and skill evaluation.

To mitigate the impact of trends on climate statistics, we use a ‘fair-sliding’ 20-year climatology to derive anomaly fields. We then compare S2S temperature forecasts from three forecast models: ECMWF’s operational Integrated Forecast System, an operational Linear Inverse Model (LIM) in support of Weeks 3-4 temperature outlooks at the Climate Prediction Center (CPC), as well as Optimal Climate Normals also utilized at the CPC. We find that relative to a fixed long-term climate, recent anomalies are
skewed toward warmth and are more persistent. In addition, models exhibit a conditional bias, showing better skill in predicting warm events. These results highlight the tendency for model performance to be inflated as a result of the bias towards predicting warm anomalies, rather than being evaluated on the ability to accurately capture overall climate variability. This study underscores the importance of accounting for trends when building S2S machine-learning tools and conducting accurate skill evaluations.
Presentation file
Cheng-YuanMing.pdf
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S2S Community Workshop
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