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A comprehensive understanding of the sources of predictability for atmospheric behavior at the subseasonal-to-seasonal (S2S) lead times is crucial for improving current prediction systems. This understanding would allow future modeling and observation efforts to focus on accurately representing specific processes relevant to this predictability problem. In recent years, machine learning (ML) methods have shown potential for skillfully forecasting atmospheric processes and extracting knowledge from data that can be complementary to physics-based Earth system models. We leverage ML by training a set of models that predict the weather regime (WR) occurring over North America for lead times of 2 through 8 weeks. WRs are defined using k-means clustering of geopotential height fields at 500hPa, and the forecasting models are trained separately with fields of variables from
different Earth system components (atmosphere, ocean, and land) as inputs. Despite the prescribed limitation of each model using only one variable as a predictor, their skill is still competent compared to persistence, which we set as our benchmark. Based on performance analysis, we assess the relative importance of each input variable and its variability across different lead times, seasons, and regimes. By using principal components as inputs, the framework allows us to identify which processes contribute the most to the predictability at different lead times, and their respective associated spatial patterns. While some of the processes found as relevant for WR S2S prediction are already studied in the literature, we highlight new sources of predictability and quantify their effect on WR occurrence.
Presentation file
Jhayron-Perez.pdf
Meeting homepage
S2S Community Workshop
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