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Quantifying improvements of multi model summer predictions over mid-latitudes with enhanced soil moisture initial conditions

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Land surface initial conditions have been recognized as a potential source of predictability at seasonal time scales. As an example, results from GLACE-2 (phase 2 of the Global Land-Atmosphere Coupling Experiment) highlighted the impact of spring soil moisture in summer near-surface air temperature prediction over Europe and Northern America with global long-range forecast systems . Yet, few studies have explored such an influence over a sufficient hindcast period to produce a robust quantitative assessment. In the framework of the FP7-SPECS project, dedicated experiments have been carried out with June-August hindcasts from 5 distinct Atmosphere Ocean Global Climate Models initialized either by realistic or climatological soil moisture conditions on May 1st.
Based on anomaly correlations and root mean square error assessments, we show that realistic initialization leads to an improved 2-meter temperature prediction skill over parts of Europe in the multi model. However no improvement is found over North-American Great Plains in spite of the high potential of this region related to intense land-atmosphere coupling. Further analyses suggest that this lack of skill stems from a common shortcoming of the models. All of them present a pronounced dry bias over this region which may exaggerate the feedback loop between soil moisture and surface climate with respect to the observations. Hence, tackling model systematic biases over the US Southern Great Plains appears as a necessary prerequisite for summer predictability enhancement.