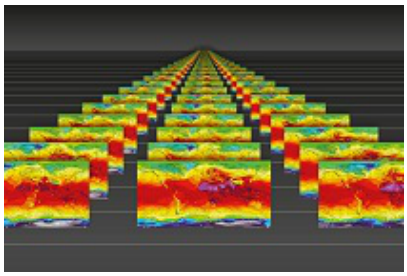

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# Subseasonal Prediction of European Summer Heat Waves in the S2S Hindcast Ensembles

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**Subseasonal Prediction of European Summer Heat Waves in the S2S Hindcast Ensembles**

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Due to their devastating impact, the prediction of heat waves beyond the weather forecasting range is of great significance to society. The potential for successful subseasonal predictions of summer heat waves stems from e.g. the fact that they are most often related to persistent anticyclonic atmospheric circulation conditions. Especially when these systems are embedded in large-scale teleconnection patterns, it is possible to extend predictable lead times before the heat event. Furthermore, it has been shown that the likelihood of reaching extremely high temperatures increases strongly if dry soils are observed in advance. As soil moisture acts as a memory of the near-surface atmospheric conditions, the coupling between the land surface and the atmosphere could provide further predictability in regions where it is strong.

In our study, we investigate the probabilistic skill of a subset of forecasting systems from the S2S database in predicting 11 European summer heat events in the period from 1999 to 2010 on the subseasonal time scale. The skill analysis is complemented by an assessment of the drivers of specific heat events and how these are represented in the S2S forecasting systems. To evaluate the ability of the models to simulate the driving mechanisms, we split the hindcast ensembles retaining those members that perform best in forecasting predictor fields such as geopotential height, sea surface temperatures, soil moisture and surface heat fluxes. The skill of the thus created sub-ensembles in predicting 2m temperatures is then compared to the forecast skill of the full ensemble. From this, we assess whether the chosen variable acts as a predictor of 2m temperatures in the different models. Our analysis reveals large differences between the models and single heat events regarding these relationships.

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