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The German Climate Forecast System 2.1: seasonal forecast performance over Europe

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In November 2020, the new version of the German Climate Forecast System, GCFS2.1, became operational at Deutscher Wetterdienst (DWD), providing new seasonal forecasts every month. The system **is based** on the Max Planck Institute for Meteorology Earth-System Model (**MPI-ESM-HR**) and is developed jointly by DWD, the Max Planck Institute for Meteorology and Universität Hamburg.

In GCFS2.1, ERA5 and ORAS5 reanalyses are assimilated using atmospheric, oceanic and sea ice nudging, respectively. From the assimilation, 50-member 6-month forecast ensembles are initialized at the start of each month. Prediction skill is assessed with a 30-member 6-month hindcast ensemble covering the time period 1982-2019 for February, May, August and November start months, and 1990-2019 for the remaining start months. Both the forecast and hindcast ensembles are generated by oceanic bred vectors with additional physical perturbations applied to the upper atmospheric model layers.

Here, we investigate the performance of GCFS2.1 summer and winter forecasts over Europe. While our main focus is on the prediction of large scale patterns that control the weather regimes during these two seasons, e.g. European blockings, special emphasis is paid on the impact of the January 2021 sudden stratospheric warming (SSW) event on the performance of GCFS2.1. The inclusion of the early phases of the January 2021 SSW event in the forecast initialisation significantly changes the GCFS2.1 forecast for February 2021 European surface climate. Prediction skill of GCFS2.1 for summer European blocking events will be also compared to the previous version GCFS2.0.