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Seasonal forecasts of the Saharan heat low characteristics: a multi-model assessment

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The Saharan heat low (SHL) is a key component of the West African Monsoon system at the synoptic scale and a driver of summertime precipitation over the Sahel region. Therefore, accurate seasonal precipitation forecasts rely in part on a proper representation of the SHL characteristics in seasonal forecast models. This is investigated using the latest versions of two seasonal forecast systems namely the SEAS5 and MF7 systems from the European Center of Medium-Range Weather Forecasts (ECMWF) and Météo-France respectively. The SHL characteristics in the seasonal forecast models are assessed based on a comparison with the fifth ECMWF Reanalysis (ERA5) for the period 1993–2016. The analysis of the modes of variability shows that the seasonal forecast models have issues with the timing and the intensity of the SHL pulsations when compared to ERA5. SEAS5 and MF7 show a cool bias centered on the Sahara and a warm bias located in the eastern part of the Sahara respectively. Both models tend to underestimate the interannual variability in the SHL. Large discrepancies are found in the representation of extreme SHL events in the seasonal forecast models. These results are not linked to our choice of ERA5 as a reference, for we show robust coherence and high correlation between ERA5 and the Modern-Era Retrospective analysis for Research and Applications (MERRA). The use of statistical bias correction methods significantly reduces the bias in the seasonal forecast models and improves the yearly distribution of the SHL and the forecast scores. The results highlight the capacity of the models to represent the intraseasonal pulsations (the so-called east–west phases) of the SHL. We notice an overestimation of the occurrence of the SHL east phases in the models (SEAS5, MF7), while the SHL west phases are much better represented in MF7. In spite of an improvement in prediction score, the SHL-related forecast skills of the seasonal forecast models remain weak for specific variations for lead times beyond 1 month, requiring some adaptations. Moreover, the models show predictive skills at an intraseasonal timescale for shorter lead times.