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10-25-day intraseasonal variability of convection over the Sahel: a role of the Saharan Heat Low and midlatitudes

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The understanding and forecast of persistent dry or wet periods of the West African Monsoon (WAM), especially those that occur at the intraseasonal timescale, are crucial to improve food management and disaster mitigation in the Sahel region. In the present study, we assess how the 10-25-day intraseasonal variability of convection over the Sahel is related to the recently documented intraseasonal variability of the Saharan Heat Low (SHL) and the associated extratropical circulation. Strongest and most frequent interactions occur when the SHL intraseasonal fluctuations lead those of convection over the Sahel with a 5-day lag. Using a non-linear event-based approach, such a combination is shown to concern about one third of Sahelian dry and wet spells, and, in the case of dry spells, to yield convective anomalies, that are stronger, last longer by at least 2 days and reach a larger spatial scale. It is then argued that the 10--25-day intraseasonal variability of convection over the Sahel can be partly explained by the midlatitude intraseasonal variability, through a major role played by the SHL. The anomalous mid-level circulations observed during Sahelian wet and dry events can be shifted from the midlatitudes, which provides a complementary mechanism to that invoking equatorial Rossby wave dynamics. These two mechanisms are likely to interfere together in a constructive or destructive way, leading to high temporal and spatial variability of the Sahelian dry and wet spells. As a particular intraseasonal event, the WAM onset is shown to be clearly favored by phases of the SHL intraseasonal variability, when the Mediterranean ventilation is weakened and the SHL able to get stronger. On the opposite, the formation of a strong cold air surge over Libya and Egypt and its propagation towards the Sahel lead to the collapse of the SHL, which inhibit the WAM onset. From these extratropical-tropical interactions, more skilful forecasts of the Sahelian wet and dry spells and of the WAM onset can be expected. In particular, the monitoring of both the SHL intraseasonal activity and that of equatorial Rossby wave should provide relevant information to forecast at least two thirds of such high-impact events.