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Variability in daily dust coverage over the central Sahara: links to the West African Monsoon system and Saharan Heat Low

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We classify maps of daily dust occurrence over the central Sahara using the neural network based system of Self Organised Maps (SOMs). Resulting states vary in terms of the frequency of dust occurrence and its location. On days with relatively high dust occurrence, dust tends to favour either a location close to the Algeria-Mali-Niger border triple point, or further to the northwest across the western half of the Algeria-Mali border. States in which dust is detected at both locations simultaneously are rare. The former location is favoured in the early summer season, while the latter prevails in July and August. High dust occurrence often migrates from the triple point to the Algeria-Mali border on subsequent days, but dust is rarely recirculated towards the triple point from here with a decline in dust occurrence more common. Analysis of climatological composites for days classified as different dust states reveals a strong link to the West African Monsoon (WAM) flow and the location of the core of the Saharan Heat Low (SHL). Monsoon surges into the southern Sahara appear to be responsible for frequent dust occurrence. Dust emission is probably related to convective complexes developing in this flow, and the dust is then held in the monsoon air as it flows towards the SHL. Over following days this system generally moves west, likely due either to interactions with AEWs or to feedbacks induced by modification of the surface radiation budget by the moist dusty air. Eventually the monsoon flow retreats and dust occurrence frequency decreases.