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Characterization of West African land surface state autumn to summer evolution regarding Sahelian rainfall variability

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The ERS backscattering coefficient (σ^0) and CMAP rainfall datasets are analyzed over period 1992-2000 to document the autumn to summer soil-vegetation water content evolution in West Africa regarding Sahelian rainfall variability.

A composite analysis performed over σ^0 field averaged between longitudes 10°W-10°E shows that the wettest (driest) July-September Sahelian rainy seasons have been preceded by negative (positive) anomalies of soil-vegetation water content over the Sudanian belt in June and positive (negative) ones over Guinea from winter to spring. While the former anomalies are linked to synchronous rainfall deficits, sign of delayed northward jump of the ITCZ, the latter do not coincide with any synchronous signal in precipitations. A 'Granger causality' analysis reveals that spring (March-May) anomalies of soil-vegetation water content are rather due to those recorded in rainfall during the preceding autumn (September-November) than to a persistence of winter σ^0 anomalies. These findings argue for inter-season memory effects in West Africa held by land surface state.

Lastly, the positive anomalies of soil-vegetation water content from winter to spring over the Guinea belt induce a steeper (a flatter) meridional gradient over the subcontinent: it has been shown that the meridional arrangement of biosphere and soil water content over West Africa is critical for monsoon dynamics.