Controls on the seasonality of the West African monsoon system are investigated using observational analyses and simulation with regional and global coupled models. Processes that determine the meridional progression of rainfall over West Africa, which features the Guinean coast at about 5N, are compared with those of the Atlantic marine ITCZ to the west and the continental interior to the east.

During April through June, greatest precipitation rates are located along the Guinean coast. During this time, the processes that maintain the rainfall maximum are essentially the same as those that maintain rainfall in the Atlantic marine ITCZ. However, while the Atlantic marine ITCZ moves north of 5N in June, the Guinean coast precipitation maximum remains stationary due to differential heating rates over the land and ocean. When the precipitation maximum resumes its northward progression, on average during the first week in July which is the onset of the continentally-controlled monsoon, it catches up with the solar forcing by moving quickly into the Sahel. The development of inertial instability over the Guinean coast is associated with the rapid rainfall decrease along the coast, accompanied by sudden cooling in the Gulf of Guinea. In contrast to its northward progression, the southward retreat of the rainfall maximum is smooth because the development of inertial instability and air/sea interactions do not play the same role in delaying its meridional movement. Implications for improving our understanding of and confidence in projections of future climate over the Sahel are discussed.