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Role of air-sea interactions on the coastal rainfall in the Gulf of Guinea during boreal spring

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The role of air-sea interactions in the boreal spring precipitation of the West African monsoon is explored through the wind variability in the Gulf of Guinea. Satellite measurements and reanalyses data are used to describe the atmosphere and the sea surface in the Gulf of Guinea from 2000 to 2009.

Previous results showed a statistical link between the strengthening of southerlies between the Equator and the Guinean coast, and precipitation along the coast. In this study, linear regressions are first performed in May-June (2000-2009) to investigate the mechanisms at stake : an equatorial SST cooling strengthens the wind north of the equator, via the SST front located along 1°N. This wind acceleration intensifies the low atmospheric local circulation, which components are surface southerlies, coastal convergence, low atmosphere southward return flow, and subsidence over the Gulf of Guinea. When this circulation is stronger than normal, it brings more humidity toward the coast, which triggers deeper atmospheric convection and increases the coastal rainfall .

In addition, an abrupt change in the surface wind pattern is observed between April and July. Composites are used to analyse temporal and spatial variations of the SST, surface wind speed and humidity, in surface as well as in altitude. A clear transition is observed during the spring season, when the wind strengthens between the equator and 5°N, which generally occurs at the end of May.

Eventually, this study emphasizes very clearly the importance of the intraseasonal variability in the seasonal evolution and setting of the guinean coastal rainfall.