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Investigation of the ocean-atmosphere-continent coupling in the Gulf of Guinea and West Africa at intraseasonal timescales in boreal spring and summer with a regional atmospheric model (WRF)

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Using 2000-2009 satellite data (Reynolds for SST and QuikSCAT for surface winds), a strong ocean-atmosphere coupling was put in evidence in the equatorial region (northern front) of the Tropical Atlantic cold tongue, implying surface winds and sea surface temperature (SST): a cold (respectively warm) SST anomaly strengthens (weakens) southerlies between the Equator and the Guinean coast during a few days. Similar investigations with ERA-Interim and NCEP-CFSR reanalyses emphasized the significant contribution of these wind fluctuations to the triggering of the Guinean coastal rainfall in spring. In this study, mechanisms at stake behind the statistical results are investigated by using a regional atmospheric model, WRF (Weather Research and Forecasting) with horizontal resolution of 50 km for the period April-July 2006. First, the influence of the SST on the spring and summer precipitation is quantified through the analysis of the moisture flux convergence over the continent. Then, some hints of a potential feedback from the changing continental surface (under rainy conditions) over the regional atmospheric circulation are shown , likely involving the southward low-level atmospheric circulation (or Shallow Meridional Circulation), subsidence over the Gulf of Guinea and then surface southerlies again, closing an active loop of ocean-atmosphere-continent interaction.