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Seasonal cycle of the low salinity waters in the gulf of Guinea described by satellite measurements and numerical modelling

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The seasonal cycle of the coastal low salinity waters present at the surface of the gulf of Guinea, in the bay of Biafra and offshore the Congo mouth, is analyzed to determine the different mechanisms of variability such as local or basin-wide dynamics and forcing.
The seasonal variations of the tropical Atlantic dominate the variability of the basin and modulate large scale phenomena as the cold tongue, equatorial waves, termination of the equatorial undercurrent, etc.
However the impact of this strong seasonal cycle on the seasonal variations of the low salinity waters remains unclear as the coastal dynamic of the gulf of Guinea is not fully understood.

New data from satellite measurements with AMSR-E for 2003-2010 allow us to better understand the seasonal variations of sea surface salinity in the gulf of Guinea, which is not resolved correctly by in-situ climatologies due to the lack of observations in certain regions.
We use a high horizontal and vertical resolution model based on the NEMO/AGRIF modelling platform with realistic configurations of the tropical Atlantic and sensibility tests to determine and isolate the different mechanisms which play an important role on the seasonal cycle of the low salinity water.
In addition, mixed layer trends are computed to have a quantitative analysis of the contribution of each mechanism.

The seasonal cycle revealed by satellite measurements is complex.
The connection between low salinity waters on both sides of the equator is more important than expected from climatology from december to march-april.
These seasons correspond to the maximal offshore extension of the low salinity waters north and along the equator.
A southward extension of the Congo plume is observed in february.
During the rest of the year however the extension of low salinity waters is limited to the mouth of the Congo river and the bay of Biafra, with weaker intensity of the salinity anomalies.

At the basin scale, the seasonal cycle of fresh water content is well explained by local precipitations and runoffs, but the offshore extension of the low salinity waters results from a combination of local trade winds forcing and basin-wide variability of the equatorial and tropical circulation.
It appears that north and south of the equator, the maximum offshore extension of low salinity waters results from the displacement of the Guinea Current in the north and the Congo Gabon Under Current, while along the equator the maximal extension is due to the northern branch of the South Equatorial Current.