Geophysical Research Abstracts
Vol. 17, EGU2015-9702-1, 2015
EGU General Assembly 2015
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Seasonal mixed-layer salinity balance in the Eastern tropical Atlantic ocean

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The eastern tropical Atlantic is characterized by well-known coastal upwellings along the eastern border of subtropical oceans. These upwellings are generally characterized by ocean temperature. However salinity can have a impact on this phenomena through it effect on density.
A regional numerical simulation is used to investigate the different processes that control the seasonal cycle of the salinity in the mixed layer in the Eastern Tropical Atlantic in both hemispheres. The simulated variations are validated against recent observations. In the northern hemisphere the mixed layer salinity evolution results from a suitable interplay between ocean and atmosphere forcing. The primary role of the atmosphere is a seasonal freshening, according to the seasonal march of the ITCZ and to rivers outflow. The ocean brings salty water back in the mixed layer mainly by the vertical salinity diffusion. Details of the seasonal effect of the latter differ along the African coast. In the southern hemisphere , the mixed layer salinity is mainly controlled by the oceanic contribution. The latter is driven by horizontal advection of freshwater from the Guinea Gulf regions, while vertical salinity diffusion attenuates this effect because of a strong salinity stratification and intense mixing during part of the year.
The investigation of relative contribution of mixed layer salinity and temperature on mixed layer density shows that salinity may have a leading impact on density, in the northern hemisphere, in July-August and February-March. In the southern hemisphere, salinity effect on density is generally less important than the temperature effect.