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Seasonal mixed-layer salinity balance in the tropical Atlantic Ocean: mean state and seasonal cycle

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We investigate the causes of the seasonal cycle of the near surface salinity using a mixed-layer salinity model and a combination of satellite products, atmospheric reanalyses and in situ observations for the period 2000-2008, in the tropical Atlantic Ocean. We find that the balance differs from one region to another. In the western tropical Atlantic, it is controlled by horizontal advection from March to November and by freshwater flux and entrainment for the rest of the year. In the central tropical Atlantic, it is mainly due to the strong contribution of precipitation in agreement with previous results. In the northeastern tropical Atlantic, all terms contribute to the mixed layer salinity between December and March; during the rest of the year, precipitation and zonal advection mainly control the balance. In the Gulf of Guinea, it is driven by freshwater flux from October to February; from March to July, it is controlled by horizontal advection and entrainment; from August to September, mixed-layer salinity variability is weak. Finally, in the Congo region, it is driven by freshwater flux (precipitation and runoff from Congo River) from September to December, by horizontal advection during January to March and by vertical entrainment during the rest of the year (April to August). There are some discrepancies between observed and modelled salinity tendencies. Some of them are due to our model formulation, which does not explicitly account for the effect of vertical diffusion. Uncertainties of observation products, which force the model, are also sources of errors.