



SMOS salinity in the subtropical north Atlantic salinity maximum: Observation of the surface thermohaline horizontal structure and of its seasonal variability

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The seasonal variability of the surface horizontal thermohaline structure is investigated in the subtropical and tropical north Atlantic Surface Salinity Maximum (SSM) at length scales from 5-10 km to more than 500 km. The near surface temperature and salinity data from merchant ship thermosalinograph (TSG) transects across the Atlantic, from ISAS product interpolated from Argo profiles, and a combination of SST from Tropical Microwave Imager (TMI) and SSS from the recently launched Soil Moisture and Ocean Salinity (SMOS) satellite, were used as complementary tools to compute the horizontal temperature, salinity and density gradients and the density ratio in the northern subtropical-tropical Atlantic. During late winter, in north-eastern SSM, the thermohaline compensation is observed for wavelengths from 5-10 km to more than 500 km. In spite of large and sharp surface thermohaline fronts a very weak density surface horizontal gradient is observed. In contrast, in the southern SSM, at large scale (>200 km) the density ratio is controlled by the salinity gradient and the horizontal density gradient is sharpened by a constructive contribution of opposite salinity and temperature gradients. During summer, the density ratio is dominated everywhere by the salinity gradient which enhances the horizontal surface density gradient in particular the south-western SSM, in the Amazon-Orinoco run off region. The first attempt in using SMOS SSS and TMI SST in order to retrieve the surface density ratio and horizontal density gradient is promising. We suggest that the surface density ratio and horizontal density gradient result from the straining and mixing of surface thermohaline properties that may play important roles in the deepening and re-stratification of the oceanic mixed layer.