



Interannual variability of the mixed layer winter convection and spiciness generation in the Eastern Subtropical North Atlantic

Nicolas Kolodziejczyk, Gilles Reverdin, and Alban Lazar
France, LOCEAN-IPSL, Université Pierre et Marie Curie, Paris, France

The Argo data set is used to study the winter conditions in the north-eastern subtropical-tropical Atlantic during 2006-2012. During winter 2010, the mixed layer depth is abnormally shallow and a strong negative anomaly of density compensated salinity ('spiciness') is generated in the permanent pycnocline. This is primarily explained by unusual weak buoyancy flux during the late winter in the subtropical north-eastern Atlantic (NEA). These conditions contrast with the 5 other studied winters, that show deeper mixed layer and positive spiciness anomalies in the permanent pycnocline. Particularly deep mixed layer and strong spiciness anomalies are observed during late winter 2012. The conditions during winter 2010 are likely explained by historically low North Atlantic Oscillation (NAO) and high Tropical North Atlantic index (TNA). Interannual variability of the eastern subtropical mixed layer is investigated using a simple 1-D bulk model including a mean thermohaline (temperature and salinity) linear profiles, and turbulent kinetic energy (TKE) conservation in the upper ocean layer, and interannual air-sea buoyancy forcing during the fall-winters 2006-2012. The mixed layer depth and the thermohaline ('spiciness') anomalies generated in a strongly compensated layer at the base of the mixed layer and in the permanent pycnocline are associated with the convective mixing driven by the atmospheric buoyancy flux during the boreal winter season.