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TITLE: Occurrence and characteristics of mesoscale eddies in the tropical northeastern Atlantic Ocean

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ABSTRACT:

Abstract. Coherent mesoscale features (referred to here as eddies) in the tropical northeastern Atlantic Ocean (between 12?22° N and 15?26° W) are examined and characterized. The eddies' surface signatures are investigated using 19 years of satellite-derived sea level anomaly (SLA) data. Two automated detection methods are applied, the geometrical method based on closed streamlines around eddy cores, and the Okubo?Weiß method based on the relation between vorticity and strain. Both methods give similar results. Mean eddy surface signatures of SLA, sea surface temperature (SST) and sea surface salinity (SSS) anomalies are obtained from composites of all snapshots around identified eddy cores. Anticyclones/cyclones are identified by an elevation/depression of SLA and enhanced/reduced SST and SSS in their cores. However, about 20 % of all anticyclonically rotating eddies show reduced SST and reduced SSS instead. These kind of eddies are classified as anticyclonic mode-water eddies (ACMEs). About 146 ± 4 eddies per year with a minimum lifetime of 7 days are identified (52 % cyclones, 39 % anticyclones, 9 % ACMEs) with rather similar mean radii of about 56 ± 12 km. Based on concurrent in situ temperature and salinity profiles (from Argo float, shipboard, and mooring data) taken inside of eddies, distinct mean vertical structures of the three eddy types are determined. Most eddies are generated preferentially in boreal summer and along the West African coast at three distinct coastal headland regions and carry South Atlantic Central Water supplied by the northward flow within the Mauretanian coastal current system. Westward eddy propagation (on average about 3.00 ± 2.15 km d?1) is confined to distinct zonal corridors with a small meridional deflection dependent on the eddy type (anticyclones ? equatorward, cyclones ? poleward, ACMEs ? no deflection). Heat and salt fluxes out of the coastal region and across the Cape Verde Frontal Zone, which separates the shadow zone from the ventilated subtropical gyre, are calculated.

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