Seasonal energy analysis for baroclinic waves in equatorial Atlantic through a diagnostic scheme for energy flux

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This study applied a gravity-reduced ocean model to simulate three baroclinic normal modes covering 20 years for energy analysis in Atlantic Ocean. The model, considering lateral mixing, is driven by decomposed wind forcing for each mode. Energy flux were calculated through a recently proposed diagnostic scheme with model output for all the three modes. The scheme is capable of altering pressure flux to the direction parallel to group velocities of Rossby and mixed Rossby waves in equatorial region (4° N to 4°S) without affecting the divergence. The obtained annual energy flux confirmed the dominant of westward Rossby waves in the northern and southern part of the equatorial region, while eastward Kelvin and mixed Rossby waves are most prevail in central and eastern part. The results are consistent with the fact that in the west tropical Atlantic, the most prominent signal is annual and in the central and east Atlantic, is semi-annual. Additionally, three monthly averaged energy flux revealed the seasonal energy cycle of baroclinic waves in equatorial Atlantic. Two energy sources in August and April emerged in western (around 35°W) and central part (around 15°W) of the equator in Atlantic ocean respectively. Those results suggested that the energy flux calculated by new proposed scheme in Atlantic Ocean can provide a powerful tool for energy analysis making significant contributions for further climate predictions.

Keywords: Equatorial basin mode, Energy flux, Tropical Atlantic, Seasonal variability

