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Dynamics of the combined Extra-Equatorial and Equatorial Deep jets in the Atlantic

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The available meridional sections of velocity with high vertical and meridional resolution reveal tall eastward jets at 2°N and 2°S, named the extra-equatorial jets (EEJ), straddling the stacked eastward and westward jets of smaller vertical scales right at the equator, the so-called equatorial deep jets (EDJ). The dynamics underlying the formation of the EEJ is investigated along with their relationship to the EDJ in the equatorial Atlantic. We argue that the formation mechanism for both types of jets is linked to a specific temporal variability in meridional velocity and that the zonal extension of EEJ is favored by a depth confined forcing over the first thousands meters . A process study is complemented by high resolution primitive equation simulations based on a realistic background stratification and an oscillating forcing inside the western boundary layer, localized in the upper 2500m. The modelled EEJ and EDJ response is confined to the same depth range as the forcing whereas potential vorticity homogenization within specific depth ranges of westward EDJ is found to be latitudinally confined between 2°N and 2°S by the EEJ. The combined EDJ and EEJ increase lateral mixing at the equator but also act as barriers at $\pm 2°$ of latitude.