Subsurface water property structures along 80°E under the positive Indian Ocean dipole mode in December 2019

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High-accuracy ship-based observations were conducted at 80°E in the Indian Ocean. The salinities below the mixed layer in 2019 were observed to be lower than that in 1995. This decrease in salinity was mainly attributed to anomalous advection associated with one of the strongest positive Indian Ocean dipole (pIOD) events in 2019 through analysis of the gridded time series of the salinity distributions based on the Argo float array. Increments and reductions in nitrate and dissolved inorganic carbon (DIC) and dissolved oxygen (DO), respectively, were also detected on the isopycnal surfaces where reductions in salinity were observed, which suggested that the anomalous upwelling and westward advection associated with the pIOD in the eastern part of equatorial regions resulted in low-salinity, low-oxygen, and nutrient-rich waters in the central off-equatorial region of the Indian Ocean. However, the downward isopycnal heaving, which was also associated with pIOD, was too strong to increase nitrate below the mixed layers and might have suppressed biological activity. The heaving also affects the DIC and DO distributions, and the effect of interannual changes like the Indian Ocean dipole is essential to estimating changes in anthropogenic carbon storage. This result was considered to be a case study, and based on only two occupations, assessment with more intensive observations and realistic numerical simulations are necessary in the future.

Keywords: salinity changes, positive IOD, dissolved oxygen changes

