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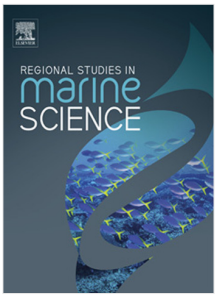

Seasonal variations of hydrographic parameters off the Sudanese coast of the Red Sea, 2009–2015

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Seasonal variations of hydrographic parameters off the Sudanese coast of the Red Sea, 2009-2015

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Abstract:

The variations of temperature and salinity in the Sudanese coastal zone of the Red Sea are studied for the first time using measurements acquired from survey cruises during 2009-2013 and from a mooring during 2014-2015. The measurements show that temperature and salinity variability above the permanent pycnocline is dominated by seasonal signals, similar in character to seasonal temperature and salinity oscillations observed further north on the eastern side of the Red Sea. Using estimates of heat flux, circulation and horizontal temperature/salinity gradients derived from a number of sources, we determined that the observed seasonal signals of temperature and salinity are not the product of local heat and mass flux alone, but are also due to alongshore advection of waters with spatially varying temperature and salinity. As the temperature and salinity gradients, characterized by warmer and less saline water to the south, exhibit little seasonal variation, the seasonal salinity and temperature variations are closely linked to an observed seasonal oscillation in the along-shore flow, which also has a mean northward component. We find that the inclusion of the advection terms in the heat and mass balance has two principal effects on the computed temperature and salinity series. One is that the steady influx of warmer and less saline water from the south counteracts the long-term trend of declining temperatures and rising salinities computed with only the local surface flux terms, and produces a long-term steady state in temperature and salinity. The second effect is produced by the seasonal alongshore velocity oscillation and most profoundly affects the computed salinity, which shows no seasonal signal without the inclusion of the advective term. In both the observations and computed results, the seasonal salinity signal lags that of temperature by roughly 3 months.