



Vertical distribution of Radium isotopes within the Agulhas Retroflection Area

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The radioactive element Radium exists mostly in the dissolved state in the marine environment and its naturally occurring isotopes have been widely used as tracers of water masses. The two long-lived isotopes ^{226}Ra and ^{228}Ra (half-lives 1600 and 5.8 years, respectively) have clearly distinctive sources in the marine environment. Both are set free from oceanic sediments through decay of a particle-reactive Thorium isotope and released into the water column. But due to a difference in both the distribution of their respective parent nuclides and half-lives, for ^{226}Ra this process is strongest over deep-sea sediments while ^{228}Ra tends to accumulate to high activities in shallow areas like continental shelf regions. In accordance with its relatively short half-life, the activity of ^{228}Ra decreases with distance from the source and is extremely low in the ocean interior and in open ocean surface waters. Increased ^{228}Ra activities in land-remote waters can hence be taken as an indicator of advection of coastal waters.

The combination of both isotopes and their application in regions of intense mixing of different water masses has been proven useful in order to obtain information on the origin of the water bodies involved. Within the highly variable, mesoscale flow field of the Agulhas Retroflection Area, previous studies have shown that ^{226}Ra and ^{228}Ra surface water activities vary strongly over a short distance and seem to have opposing trends of activity changes, a feature that should help especially in a better distinction of the origin of cyclonic eddies: While waters moving north from the Antarctic zone are typically low in ^{228}Ra , cyclones developing locally along the South African coast can be expected to carry a strong coastal signal. In contrast, ^{226}Ra activities increase towards the south and are higher in subantarctic waters caused by the influence of the

upwelling Circumpolar Deep Water within the Antarctic Circumpolar Current.

We will present ^{226}Ra and ^{228}Ra activities from four vertical profiles sampled during Polarstern expedition ANT XX/2, comprising two cyclonic eddies, a matured Agulhas Ring and the Retroflection Area proper. In order to obtain samples as close as possible to the end-members of each regime, sampling sites were chosen using steric sea-surface height anomalies (SSH data) from MODAS (Modular Ocean Data Assimilation System).