

Mercury in sediments from shelf and continental slope at Campos Basin near Rio de Janeiro, Brazil

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Mercury (Hg) is a global pollutant due to its ability to undergo long-range transport from source regions to remote parts of the world, and its ubiquitous presence in aquatic ecosystems. The Hg isotope ratios could be an effective tool for tracing the sources and process of Hg in the environment. This study aimed to establish the distribution of mercury in surface sediments of three transects (25- 3000m water depth) in continental shelf and slope in Campos Basin-RJ-Brazil, using the Hg isotopes to understand the geochemical processes relating to Hg cycling that occur in a subtropical coastal environment. The study area was divided into three transects: A (located to the south and close to a upwelling area), D (located opposite the mouth of the Paraíba do Sul River) and I (located north near the top of Vitória-ES). Sampling isobaths were 25, 50, 75, 100, 150, 400, 700, 1000, 1300, 1900, 2500 and 3000m. The Total Hg, MMHg and Hg stable isotopes were determined based on EPA Method 1631, EPA method 1630 and Foucher and Hintelmann (2006), respectively. The silt/clay ranged from 0.05 to 95%, and the organic carbon (OC) from 0.07 to 1.43 % for all transects. THg and MMHg concentrations in the shelf were 11.9 ± 7.2 (1.7-22.2) ng.g^{-1} and 0.15 ± 0.12 (0.02 - 0.40) ng.g^{-1} ; in the slope 30.3 ± 9.2 (11.6 - 51.6) ng.g^{-1} and 0.13 ± 0.06 (0.03 -0.29) ng.g^{-1} , respectively. The $\delta^{202}\text{Hg}$ and $\Delta^{199}\text{Hg}$ varied from -0.32 to -1.85 ‰ ($-0.79 \pm 0.44\%$) and -0.41 to 0.09 ‰ ($-0.03 \pm 0.12\%$) for all transects, respectively. The delta values between both regions are significantly different, the shelf region showed $\delta^{202}\text{Hg}$ from -0.59 to -2.19 ‰ (mean: $-1.52 \pm 0.65\%$) and $\Delta^{199}\text{Hg}$ from -0.53 to 0.08 ‰ (mean: $-0.27 \pm 0.55\%$), and the slope region were observed $\delta^{202}\text{Hg}$ values from -0.32 to -1.82 ‰ (mean: $-0.73 \pm 0.39\%$ n=18) and $\Delta^{199}\text{Hg}$ from -0.23 to 0.09‰ (mean: $-0.02 \pm 0.08\%$ n=5). The slope appears to be enriched with heavier isotopes compared to the shelf, however, in the upper slope we can observe some points with lighter isotopes. Some in the transect D, located closer to the coast (25 and 50 m of depth), showed the most negative isotope signature. This transect receives direct influence from the Paraíba do Sul river, so the Hg composition may be explained the riverine contribution characterized by Hg of different origin. Moreover, the negative $\delta^{202}\text{Hg}$ values mainly observed in some stations in the shelf region, can be caused by process such as degassing of dissolved Hg^0 , volatilization, microbial reduction and photoreduction, which tend to deplete the lighter Hg isotopes in the product Hg^0 . Likewise, process such as physical settling of Hg adsorbed to particles and atmospheric deposition of Hg could also be a possible cause of the lower $\delta^{202}\text{Hg}$ values. In addition, the positive $\Delta^{199}\text{Hg}$ values could be caused due atmospheric Hg deposition, which represents a significant source in the biogeochemical cycle of Hg in oceans.