

Total Mercury in Bottom Sediment Samples from Admiralty Bay, King George Island, Antarctic Region

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Abstract: Brazilian Antarctic Program (PROANTAR) was implemented in January 1982. Brazilian activities in Antarctic are based at the "Comandante Ferraz" Antarctic Station (EACF), in four quarters settled on Brendsfield strait, Elephant, Nelson and King George (62°05'S and 58°25'W) Islands. Since 1982 several scientific projects have been developed and one of them is called Hydrogeochemistry of Admiralty Bay. One of the purposes of this recent project is to assess the content of heavy metals in sediment samples. The main goal of the present work was to determine total mercury concentration and phosphorus (organic and total) in sediments samples from Admiralty Bay, Antarctic region. Bottom sediments were collected during the sampling trip in January/February 2003 (21st Antarctic campaign -summer season) by using a steel Van Veen-type dredge. Although 21 sampling sites have been visited, only 14 sediment samples could be collected. After collecting the samples, they were frozen (-20 °C) and kept in this condition. In the laboratory all samples were previously dried at 40°C in a ventilated oven and passed through a 0.065 mm sieve and homogenized before analysis. For total mercury determination sediment samples were analyzed by FIA-CV-AAS technique using a FIMS 100 from Perkin Elmer. Samples were digested by a mixture of HNO₃, H₂SO₄ and H₂O₂ in Teflon vials. The vials were closed and left overnight at room temperature. In the following day, the vials were put into an aluminum block at 900C and left there for 3 hours. The validation of the methodology was performed by certified reference materials analysis: Buffalo River Sediment (NIST SRM 2704), Estuarine Sediment (NIST SRM 1646a) and Lake Sediment (BCR CRM 280). Relative standard deviation ranging from 1.3 to 2.9 and relative errors ranging from 0.5 to 3.7 were found in the reference materials analyses. The concentration of total mercury in the sediment samples varied from 53 to 210 µg kg⁻¹ in all samples distributed along Admiralty Bay. Only sample 12 (point 12 - located at Mackellar Inlet) showed a total mercury concentration of 1789 ± 36 µg kg⁻¹, value considered too high for this region. The sample 17 (point 17- located at the eastern part of Martel Inlet) showed the lowest value (53 ± 2 µg Hg kg⁻¹). The values obtained for total phosphorus in the sediment samples were: the highest value at point 12 (838.9 µmol-P/g) and the lowest value, at point 17 (639.0 µmol-P/g). Inorganic P content was higher at point 12 (631.4 µmol-P/g) and lower at point 3 (494.7 µmol-P/g). Organic P showed the higher value in front of the Brazilian base (264.9 µmol-P/g) and the lower value at point 17 (44.0 µmol-P/g). At point 12, the percentage of inorganic P fraction was around 75 %. It indicates the terrestrial input of inorganic matter in this sediment with low contribution of organic matter. This remote zone seems to show mercury concentration values in the reference levels except for the sites that show important processes of accumulation or intense input from the soil of this region.

Key words: sediments, total mercury, antarctic region