

**DISTRIBUTION OF METALS AND RADIONUCLIDES IN THE
OFFSHORE OF KALPAKKAM, SOUTH INDIA**

RAJA R

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ABSTRACT

Indira Gandhi Centre for Atomic Research, Kalpakkam is located along the east coast about 60 km from Chennai. In order to assess the levels of major elements, trace elements, natural radionuclide and man made radionuclides into the off shore environment of Kalpakkam about nine water samples were collected during March (Summer) 2005 in the off shore of Mamallapuram, Kalpakkam and river Palar. Thirty sediment samples were collected in the month of March (Summer) 2005 and August (SW Monsoon) 2005 in the offshore of Mamallapuram, Kalpakkam and river Palar for each sampling. The textural characteristics shows an inflow of 27.4%, 15.5% and 6.7% of medium sand respectively at Mamallapuram, Kalpakkam and river Palar with an outflow of 32.4%, 20.3% and 27% of fine sand respectively at the off shore of Mamallapuram, Kalpakkam and river Palar.

The statistical parameters of sediment shows medium fine sand and fine sand for the month of March (Summer) 2005 whereas coarse medium sand, medium fine sand and fine sand for the month of August (SW Monsoon) 2005 w as

observed. In general coarser of the particles were entered into the study area. The sorting of sediment observed as poorly sorted, poorly sorted and moderately sorted for the month of March (Summer) 2005 whereas poorly sorted for the month of August (SW Monsoon) 2005 in the offshore of Mamallapuram, Kalpakkam and river Palar respectively. The skewness and kurtosis shows the finely skewness and leptokurtic is observed for both March (Summer) 2005 and August (SW Monsoon) 2005 respectively. An average concentration of Mg, K, Ca, Mn and Fe in this study was 0.56, 1.56, 2.30, 0.06, 2.00 and 0.8% respectively for the month of March (Summer) 2005 and 0.54, 1.5, 1.8, 0.04, 2.00 and 0.63% for the month of August (SW Monsoon) 2005 respectively. Comparing the average values for both the season no significant difference is observed. While comparing the world average value of Fe and Mg with the present study the lower the value was observed. The UCC normalised values of major elements with the world average of aluminium value in all the locations of the present study is less than one reveals initial stages of weathering process. Geochemically primitive nature of the sediment value shows non primitive to primitive in nature. The observed average concentration of Zn, Cu, Co, Ni and Cr was 75.0, 25.3, 47.0, 26.2 and 55.1 $\mu\text{g g}^{-1}$ for March (Summer) 2005 and 56.4, 27.1, 3.5, 33.3 and 54.5 $\mu\text{g g}^{-1}$ during August (SW Monsoon) 2005 is comparable for both the season. The geo accumulation index (Igeo) for Zn, Cu, Co, Ni and Cr were less than one in all location for both the season shows the natural weathering of sediments. The average contamination factor for Zn, Cu, Co, Ni and Cr were 1.43, 1.01, 0.59, 1.37 and 1.58 for the month of March (Summer) 2005 and 1.08, 1.08, 0.42, 1.75 and 1.56 for the month of August (SW Monsoon) 2005. the values falls between one and three shows moderate contamination for both the

season and the degree of contamination were 5.98 and 5.86 for the month of March (Summer) 2005 and August (SW Monsoon) 2005 respectively. The values were less than 6 shows the low degree of contamination in the present study. The pollution load index (PLI) were 0.36 and 0.27 for the month of March (Summer) 2005 and August (SW Monsoon) 2005 shows no pollution in the present study. The ecotoxicological study such as probable effect level (PEL) and effect range median (ERM) shows the toxicity free from trace elements in this study. An average concentration of ^{226}Ra , ^{228}Ra and ^{40}K observed in the present study were 17.19, 87.41, 381.91 respectively for the month of August (SW Monsoon) 2005 followed by 12.12, 67.94 and 293.53 respectively for the month of August (SW Monsoon) 2005. If $^{137}\text{Cs}/^{90}\text{Sr}$ ratio in seawater was between 1 and 3 it would indicate global atmospheric fallout UNSCEAR 1993. Since the average $^{137}\text{Cs}/^{90}\text{Sr}$ ratio in the present study was 1.36 it can be concluded that it would only global atmospheric fallout and there was no significant contribution/pollution by the Madras Atomic Power Station at Kalpakkam.