

River-Sea connection traced by natural radionuclides ^7Be and ^{234}Th records in sediment

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^7Be and $^{234}\text{Th}_{\text{ex}}$ activities in sediment cores off the Rhone River mouth (Gulf of Lions) were determined in order to trace the transport and deposition of suspended particulate matter (SPM) from the Rhone River and evaluate the impact of the 2008 floods through 7 cruises carried out over the period of 2007-2008. Consistently high ^7Be and $^{234}\text{Th}_{\text{ex}}$ inventories of 2000-3000 mBq cm⁻² and 3000-5000 mBq cm⁻² respectively were observed within a ~5 km radius off the Rhone River mouth and their spatial distributions showed a gradual decrease with increasing distance from the Rhone River mouth, indicating preferential deposition of the SPM in this area. Both ^7Be and $^{234}\text{Th}_{\text{ex}}$ inventories increased in 2008 compared to 2007 and are correlated to the Rhone River particulate discharges and flood occurrence. Moreover, the $^7\text{Be}/^{234}\text{Th}_{\text{ex}}$ inventory ratio appears to be a potential tracer to identify the dominant source between the river-borne particles and the marine particles. This ratio provides an effective tool to assess River and Marine influence: Zone I (R < 2.7 km, with $^7\text{Be}/^{234}\text{Th}_{\text{ex}}$ inventory ratio over 0.45) is dominated by riverine input, in contrast, Zone III (R > 8.5 km, with $^7\text{Be}/^{234}\text{Th}_{\text{ex}}$ inventory ratio less than 0.10) is predominantly fed by marine particles. In between, an intermediated area displays a mixed influence under inputs by river and marine (transition zone II, R: 2.7-8.5 km, $^7\text{Be}/^{234}\text{Th}_{\text{ex}}$ inventory ratios between 0.10 and 0.45). This zoning could help in further understanding the spreading and deposition in sediments of environmental particle-reactive contaminants in the Gulf of Lions.