

Chronology of lead concentrations and isotopes in coastal environments near rapidly growing cities in South and South East Asia, South America, and the Middle East

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Lead (Pb) is a trace metal closely related to anthropogenic activity, mainly via leaded gasoline and coal combustion. The study of Pb concentrations and isotopes in seawater, sediments, corals and aerosols allows for a systematic look at its sources and their time evolution in natural environments. Here we will discuss results from projects in South and South East Asia, South America, and the Middle East, in regions that have seen quick socio-economical changes over the past half-century that have left environmental signals. These results highlight the usefulness of the method, indicate the degree of complexity of these systems, and point to the need for a continuous monitoring of anthropogenic trace metals in the small coastal scale to be able to assess the larger oceanic scale effects of human activity.

First, coral data from South and South East Asia near Vietnam, Sumatra, and Chagos Island will be discussed as they track Pb emissions from nearby sources in China, Indonesia, and India, showing increasing concentrations of sources with low $\text{Pb}^{206}/\text{Pb}^{207}$ isotopic ratio (IR) ~ 1.15 . Contrastingly, Singapore coral and water data evidence a more complex system, with an apparent mix of two sources (IR ~ 1.21 and ~ 1.14) where either an unresolved third source or an isotope exchange process should be invoked.

Then, sediment records from the Guanabara Bay in Rio de Janeiro will be shown, with a strong anthropogenic signal of low IR (~ 1.16). As Brazil uses alcohol instead of gasoline since the 1980's, the Pb chronology is unique.

Finally, we will compare these data to coral and sediment data from Kuwait with a clear mix of riverine natural Pb and anthropogenic sources (IR ~ 1.20 and ~ 1.15). The comparison will focus on concentration factors, potential sources and their magnitude, and other relevant factors.