

Pb and Pb Isotopes throughout the Global Ocean, GEOTRACES style

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Although I have worked on many problems over the years, in the spirit of “what have you done for us lately?” I will talk about our work on the International GEOTRACES project, which has taken up the biggest chunk of my time during the past 10 years as a part of the national and international project leadership and through fieldwork and lab efforts. Many people around the world have contributed to GEOTRACES and I thank them all for their contributions which multiply all of our efforts. In another talk, Jessica Fitzsimmons will talk about our lab’s work on iron in the ocean, so in this talk I will focus on our work on Pb and Pb isotopes in the global ocean. Anthropogenic Pb emissions from high temperature industrial activities and alkyl lead gasoline consumption during the past 200 years make the study of Pb in the ocean one of the great inadvertent tracer experiments where we can see sources rise and fall and new ones replace them. The radiogenic character of lead imprints different Pb sources with three distinct isotope ratios. In some cases, sources are sufficiently temporally or spatially isotopically distinct that we can tell where lead in a portion of the ocean came from, and sometimes even when it sank from the surface into the depths. In this presentation, I will present data on Pb and Pb isotopes from ~1500 measurements on seawater, coral, and marine sediment samples collected within the past decade in collaboration with my couthors. This data comes from samples from most of the major ocean basins: North and South Atlantic Ocean, North and South Pacific Ocean, Indian, and Southern Oceans. We will show how the surface and deep water masses of the ocean are imprinted by their regional anthropogenic signatures and how these have evolved in time over the anthropogenic era. Regional and temporal differences in Pb isotope ratios allow us to evaluate sources and timing (e.g., how long did it take Pb to get from the surface of the northern North Atlantic to the bottom waters of the Eastern Atlantic and South Atlantic?).