

**FRANKLIN CRUISES FR 8/90, 5/92 AND 8/93
DATA DOCUMENTATION
JGOFS WESTERN EQUATORIAL PACIFIC PROCESS STUDY**

[1] General:

Parameter: Profiles of ^{226}Ra , ^{210}Pb , and ^{210}Po
Principal Investigator: Philip Towler
Institute Address: Marine Chemistry Laboratory, School of Chemistry, The University of Melbourne, Parkville, Victoria 3052, Australia

E-Mail Address: jdsmith@primus.com.au
List of Parameters: ^{226}Ra , ^{210}Pb , and ^{210}Po
List of Units: Specific activity (Bq m^{-3})

[2] Sampling:

Gear (e.g. CTD, pump, etc.): CTD; 10 litre Niskin bottles
Standard Depths: Hydrochemistry depths: see Hydrochemistry data
Chemicals used: Spiked with ^{133}Ba (for ^{226}Ra), stable Pb, and ^{208}Po .
Special Procedures: See method. Samples from each depth were pressure-filtered through cellulose nitrate membrane filters ($0.45\mu\text{M}$ pore diameter) and the filtered water collected

Comments and Notes: Sampled at 10°N , 5°N , Equator, 5°S and 10°S along 155°E .

[3] Analysis:

Instrument: Alpha spectrometry (^{210}Po); atomic absorption spectrometry (Pb); and liquid scintillation counting (^{226}Ra)
Method: See method below.
Precision: Given in Table based on one standard deviation from counting statistics.

Comments: FR 9205: data from only one station
FR 9308: data for dissolved ^{210}Po not available due to very low recovery rates. Particulate data fine.

[4] Results:

Quality of Data: FR 9308: good.
FR 9205: from station at 3°S , 155°E : good
Known Problems: Low recovery rates for dissolved ^{210}Po on FR 9308 meant that it was not possible to calculate residence times in each depth bin.

[5] Brief description of analytical methods

Water samples were collected in 10-L Niskin bottles, using 4 bottles per depth. The water was pressure filtered through $0.45\mu\text{m}$ cellulose nitrate membrane filters

and collected in separate plastic bins. The filters, containing particulate material, were folded and stored in plastic bags for processing ashore. Dissolved ^{226}Ra , ^{210}Pb , and ^{210}Po were preconcentrated from the filtered seawater samples (Towler et al., 1996) after being spiked with yield tracers (^{133}Ba , stable Pb, ^{208}Po) by adsorption onto MnO_2 -coated magnetite. The loaded magnetic adsorbent was collected by siphoning the water containing the loaded magnetic adsorbent through two bottles in series, each held between two magnets. The collected, loaded adsorbent was returned to the laboratory ashore for analysis. ^{210}Po was spontaneously plated onto an Ag disk that was presented for alpha-spectrometry. The activity of ^{210}Pb in the seawater sample was determined from a second measurement after ingrowth of the ^{210}Po daughter in solution. Pb recovery was measured by atomic adsorption spectrometry and the appropriate correction made to the ^{210}Pb activity. ^{226}Ra in the residual solution was measured by liquid scintillation counting after successive precipitations with PbSO_4 and BaSO_4 followed by re-solution with EDTA. ^{226}Ra concentrations were corrected according to the recovery of the ^{133}Ba spike measured by gamma-spectrometry.

The filters containing particulate ^{210}Pb and ^{210}Po were spiked with stable Pb and ^{208}Po and digested in boiling 2M HCl. The samples were centrifuged and the ^{210}Po plated onto an Ag disk from the supernatant solution. ^{210}Pb was determined in this solution as described above.

[6] References:

Towler, P.H. (1995). Naturally occurring radionuclides in the marine environment. PhD thesis, University of Melbourne, Melbourne, Victoria, Australia, 165pp.

Towler, P.H. and J.D. Smith (1997). Distribution of ^{226}Ra and ^{210}Pb in the mixed layer of the western equatorial Pacific Ocean. *Marine and Freshwater Research* **48**, 371-375.

Towler, P.H., Smith, J.D., and D.R. Dixon (1996). Magnetic recovery of radium, lead and polonium from seawater samples after preconcentration of manganese dioxide coated magnetite. *Analytica Chimica Acta* **328**, 53-59.

[7] Comments:

A new method (Towler et al., 1996) was used to preconcentrate ^{226}Ra , ^{210}Pb , and ^{210}Po from filtered seawater samples. Recovery of dissolved ^{210}Po was low, leading to unreliable results. Without information on this shorter-lived radionuclide it was not possible to calculate particulate residence times in finer layers corresponding to the depths sampled.