SEAWATER IRON ANOMALY AT LOIHI SEAMOUNT AND PUNA RIDGE BY SHIPBOARD FLOW INJECTION ANALYSIS

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ABSTRACT

A new rapid and sensitive method for determining total dissolved iron in seawater has been developed. The technique combines in-line preconcentration of iron from seawater using immobilized 8-hydroxyquinoline with a flow injection analysis (FIA) adaptation of the batch method developed by Hirayama and Unohara. The method exploits the catalytic effect of iron on the oxidation of N,N-dimethyl-p-phenylenediamine (DPD) by hydrogen peroxide in a weakly acid solution. My FIA adaptation minimizes contamination problems relative to the batch method because it eliminates virtually all post-sampling handling. The conditions for reaction chemistry and preconcentration have been optimized. Addition of 20 different ions at 10 times their maximum seawater concentration showed no evidence of interference with the technique. The method has a detection limit of 24 pM, a precision of 2.5% at 0.35 nM, and a cycle time of 3 minutes for preconcentrating 2.5 ml of seawater.

The method has been used successfully at sea in determining concentrations of iron in seawater near Loihi Seamount. Iron anomalies were observed in all 8 hydrocasts taken within 4 km of the summit of Loihi Seamount. Pele's Vents, Kapo's Vents, and Northern Vents likely produced the observed iron anomalies. Two anomalies can not be explained by any known vent sites. One of them is observed within the West Pit Crater, therefore it is speculated that there was a hydrothermal vent at 1100 dbars within the crater. The other anomaly is at least 80 m shallower than any known vent; with the limited scope of field sampling, the source of this iron anomaly could not be identified. My data seem to show that on average, current flows to the Northwest at depths above 1050 dbars and to the West at depths below 1100 dbars. Another 11 hydrocasts were

conducted on Puna Ridge, but no significant iron anomaly associated with hydrothermal venting was observed.