

TOWARDS DEVELOPMENT OF A TRACE ELEMENT SAMPLING SYSTEM: *IN SITU* PRE-CONCENTRATION USING A BI-DIRECTIONAL PUMP

A THESIS SUBMITTED TO
THE GLOBAL ENVIRONMENTAL SCIENCE
UNDERGRADUATE DIVISION IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN

GLOBAL ENVIRONMENTAL SCIENCE

May 2016

By
Nathaniel Harmon

Thesis Advisors

Dr. Chris Measures
Dr. Mariko Hatta

ABSTRACT

A method to pre-concentrate iron (Fe) from seawater samples in the laboratory has been developed. The expectation is eventual deployment in unattended platforms in hard to access regions as well as to act as an alternative to the current rosette-based sampling system for trace elements. The system consists of a bi-directional pump (milliGAT), a holding coil, a multi-position selection valve, and external columns packed with a Toyopearl AF-Chelate-650[®] resin. From measurements of iron spiked water samples before and after pre-concentration on the resin, it was found that the iron present in the sample was successfully adsorbed on to the resin. The pre-concentration efficiency of the resin is $97.47\% \pm 0.82\%$, and the maximum capacity of the resin measured during experiments is $446.71 \pm 3.76 \mu\text{mol Fe L}^{-1}$. A detection limit for the analytical method of 355pM Fe was obtained.