

Measurement of chlorine stable isotope ratios by methyl chloride-IRMS method

J.H. WU¹ AND H. SATAKE²

¹Graduate School of Science and Technology, Toyama University, Japan wujiahong@hotmail.com

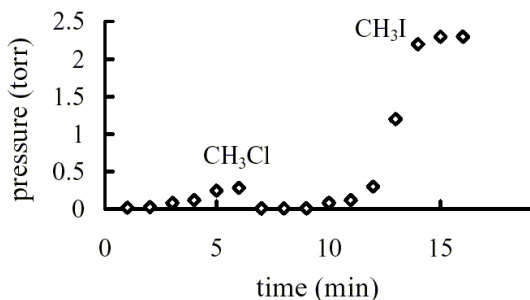
²Faculty of Science, Toyama University, Japan satake@sci.toyama-u.ac.jp

Introduction and Revolutionary new point

In conventional method for $\delta^{37}\text{Cl}$ measurement using IRMS, chloromethane (CH_3Cl) is separated from methyl iodide (CH_3I) by gaschromatograph. However, this operation is complicated and the cost is expensive. Based on the difference in vapor pressures between CH_3Cl and CH_3I , Holt et al. (1997) separated the CH_3Cl from CH_3I using the vacuum line that has two U-shaped pentane slush cold traps. It is simple method for the separation, however volatile organic freezing mixture is in contact with air directly. Reforming this point, in this study, we use the sealed cold trap, which put organic freezing mixture between the sealed double glass tubes and prevented contacting with atmosphere. However, CH_3Cl and CH_3I are vaporized at the same time on pentane melt point using sealed cold trap, which is quite different from Holt's result (1997). This may be duo to the difference in cold trap type. Therefore, new separate conditions, such as organic freezing mixture, separation temperature and processes, are searched.

Discussions and Results

As the result showing in figure below, there are 3 minutes between CH_3Cl and CH_3I 's peak at 2,2,4 trimethylpentane melt point (mp:-107°) and the sealed trap can be used to purify the CH_3Cl .



The recovery rate of CH_3Cl is 100% by repeating separation operations 2 times and the changes of $\delta^{37}\text{Cl}$ value between the before and after separation are 0.04‰ or less.

High resolution coral records of rare earth elements in coastal corals: A new environmental proxy?

TIMOTHY WYNDHAM¹, MALCOLM MCCULLOCH¹, STEWART FALLON^{1,2} AND CHANTAL ALIBERT¹

¹Research School of Earth Sciences, Australian National University, Canberra 0200, Australia (timothy.wyndham@anu.edu.au)

²Centre for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, USA

A large number of geochemical tracers in coral carbonates have been successfully employed to monitor changes in surface seawater conditions, such as temperature, the influence of river runoff and ocean upwelling. Biological responses to these variable conditions however, have generally proved more difficult to detect. Using laser ablation ICP-MS, we have obtained a high resolution coral record of REE and Mn in coastal seawater from the Great Barrier Reef of Australia. Processes controlling the cycling of these elements were identified using this record. Based on our results, we suggest that the coral record of REE and Mn is a useful proxy for aspects biological activity in coastal seawater.

The REE composition of coastal seawater, as recorded in the coral skeleton, was observed to be dependant on proximity to the coastline, seasonal factors and the influence of flood waters. When compared to the REE composition of mid shelf sites, coastal sites show a significant terrestrial influence, characterised by higher REE concentrations (greater than 10 times), light REE enrichment and an enhanced Ce anomaly. This terrestrial influence was enhanced with the influx of flood waters. REE fractionation displayed a strong seasonal cycle that correlated closely with Mn concentration. Higher La/Yb ratios and higher Mn concentrations in summer resulted from scavenging of heavy REE by particulate organic ligands and Mn reductive dissolution respectively, both processes displaying higher rates during periods of high primary productivity. The Ce anomaly also displayed a strong seasonal cycle showing an enhanced anomaly during summer and during flood events. The magnitude of the Ce anomaly appears to be controlled by the abundance of oxidising bacteria, which increases in summer and with the influence of nutrient rich flood plumes.

Given that La/Yb, Mn and the Ce anomaly are dependant on the abundances of particulate bound organic ligands, oxidisable organic matter and oxidising bacteria respectively, these tracers can be considered as proxies for various aspects of biological activity. Long coral records (greater than 100 year) of REE and Mn may therefore provide a method for comparing biological responses to changing conditions in past and present reef environments.