Poster Session 4

Commons West, Easel 10

4:00 PM to 6:00 PM

Constraining the Paleo-Environment in the Early Triassic using Magnesium Isotopes

Mary Alice Kipp (Mary Alice) Benson, Senior, Earth and Space Sciences: Geology

Mary Gates Scholar, UW Honors Program

Mentor: Fangzhen Teng, Earth and Space Sciences

Environmental conditions following the Late Permian mass extinction, one of the largest mass extinctions to happen on our planet, are not well understood. However, studying paleo-environmental conditions necessitates the use of proxies such as magnesium (Mg), as direct observation is not possible. One method to constrain environmental conditions is by using geochemistry, but until the recent introduction of multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) it was difficult to precisely measure Mg isotopes. Now, using MC-ICP-MS, fluctuations of ^{2}6Mg in the oceans can be studied in order to understand changes in seawater chemistry, and the extent of continental weathering, at a time in question. Clean dolomite samples from Zal, Iran, from the Griesbachian, Dienerian, Smithian, and Spathian stratas, have been obtained. They span ˜5000kya following the Late Permian mass extinction. Mg has been isolated from these samples using resin column chemistry. The Mg has then been analyzed using MC-ICP-MS, and numerical modeling has determined the ^{2}6Mg for each sample. The expected result was that the ^{2}6Mg would differ from current seawater levels. Current seawater ^{2}6Mg is -0.83, but studies using dolomite show a broader spectrum over time, ranging from -3.25 to -0.38. Based on results, this research could be used to constrain the primary water sources that contributed to the paleo-oceans, as well as track changing ocean chemistry due to influx of chemical precipitate from continental weathering. These changes could be quantified over the time range of our four samples. The data could also be used in correlation with a ^{8}7Sr study on weathering rates that was performed on the same dolomites. Ultimately, analogies between past conditions and current issues regarding climate change could be drawn.

Poster Session 4

Commons West, Easel 11

4:00 PM to 6:00 PM

Development of Routine Isotopic Analysis of Iron by HR-MC-ICPMS

Peiyu Wu, Senior, Earth & Space Sciences (Environmental), Japanese

Mary Gates Scholar, UW Honors Program

Mentor: Fangzhen Teng, Earth and Space Sciences

Iron is the fourth most abundant element in the Earth's crust. Both the behavior of Fe and isotope fractionations are associated with redox state. Therefore, the study of Fe isotopes is often used in tracing change of oxygen in the atmosphere and hydrosphere. My research will be divided into two parts — chemical separation of iron and mass spectrometry. Purification of iron requires a two-step anion exchange column scheme in HCl medium. With concentrated HCl, matrix and interfering elements will be eluted as waste while Fe will be retained on the resin, because iron forms strong anion chloride complexes. Iron will subsequently be eluted at lower HCl molarity. Iron isotopic analyses will be performed with HR-MC-ICPMS — an instrument that measures isotopic ratios of elements. I'll have different combinations of the acids tested, and will find out the most efficient scheme which can maximize the elimination of unwanted elements by the day of my Symposium presentation. Once the method is devised, it can be utilized by a broad implication. It can be applied to the analysis of Fe isotopes in rocks, minerals, and extraterrestrial samples. Ultimately, iron isotope measurements will be used to extrapolate geochemical cycling of iron in the ocean and sediments. Measurements can also be used to extrapolate the conditions of core formation and can provide context for Fe fractionation during magmatic processes in extraterrestrial bodies. In the marine realm, Fe isotopes can be used to trace various sources of Fe to the ocean such as atmospheric dust, hydrothermal vents, and oxic seafloor sediments.