



Sorrem, N., Them, T., "Expanded Mercury Geochemistry Record of the Early Jurassic from Alaska."

Natalie Sorrem Research Statement:

I will measure the amount of mercury in the drill core samples to reconstruct the ancient 7 mercury (Hg) cycle from drill cores retrieved from the Paris Basin, France. I will then compare my data to other geochemical datasets from the same cores to determine how climate change affected the local environment as well as two mass extinction events. Sedimentary Hg concentrations are a burgeoning proxy for understanding ancient climate change. Geologists have correlated ancient intervals of increased volcanic activity with many mass extinction events using these data. In particular, two mass extinction events during the Late Triassic and Early Jurassic have been suggested to be the result of massive volcanic activity. During the Late Triassic, the emplacement of the Central Atlantic Magmatic Province (CAMP) is thought to have caused the end-Triassic mass extinction event; likewise, the emplacement of the Karoo-Ferrar large igneous province is thought to have caused the Pliensbachian-Toarcian mass extinction event during the Early Jurassic Epoch. To-date, there are no records of these two events that come from the same location, so records of these events are pieced together from many different locations. For this project, I will work on drill cores that contain the entirety of the Late Triassic and Early Jurassic. This will give me a unique view into the causes of these mass extinctions and the recoveries associated with them. This program will start in June and focus on logistics and organization for field work. During that time, I will personally read a number of peer-reviewed papers in order to give me the background information necessary to understand the data that I will be collecting and analyzing. From there, field work will be conducted in early July. This includes core descriptions, core sampling, and local field trips to study southern France regional geology. After the samples are collected, they will be crushed and homogenized into a powder using an agate mortar and pestle at the Geochemistry of Ancient and Modern Environmental Systems (GAMES) Laboratory in the Department of Geology and Environmental Geosciences at the College of Charleston. I will then measure the Hg contents in a Milestone DMA-80 evo mercury analyzer at the GAMES Lab. The samples will be heated in stages up to 750°C, which will volatilize all mercury in the sample. The volatilized mercury will be collected onto gold beads, flushed from these beads, and then measured using atomic absorbance spectroscopy. I will use international standards to calibrate the DMA-80 and correct the raw data. The Paris Basin research will also allow me to take part in a collaborative research experience that opens the doorway for me to examine climate change and its driving factors. With this I am able to compare it to biological evolution on timescales that range from thousands to millions of years. This knowledge will be used and applied to modern coral reef ecosystems with the hope of being able to one day conserve and preserve these fragile and sensitive ecosystems. This project also gives me the opportunity to conduct field work with an international team of leading scientists who have a wide range of expertise. In addition, this opportunity will be focused on world-class drill cores that are rarely available for academicians to see, let alone gain permission to sample. Since these drill cores contain a continuous record of environmental change during the entire study interval, they will represent an important archive that will lead to many future peer-reviewed publications. In fact, I plan to be the first author of at least one publication focused on the Hg records that I generate, which I hope will prepare me for graduate school. This research opportunity will result in new networking opportunities with Dr. Them's colleagues and the ability to conduct a scientific project that would not normally be available to graduate students.

In the Department of Geology and Environmental Geosciences, I have been conducting research under Dr. Theodore Them II over the last 15 months. I have been analyzing Paleocene to Eocene paleo-soil samples across a latitudinal transect from the North American interior, which represents the focus of my senior thesis with the Honors College. In order to analyze the samples, I have learned how to crush samples into a homogenized powder using an agate mortar and pestle. These samples are run using a Milestone DMA-80 evo mercury analyzer. Aside from that, I also had the opportunity to conduct field work for one week in Sailor Canyon, California. While there, I partook in a scouting expedition searching for ammonites and future field sites.