Determining If Iron & Hematite Can Be Indicators of Climate Change

Owen Yazzie[1], Christopher Lepre[2,3], Clara Chang[3]

[1]Arizona State University, [2]Rutgers University, [3]Lamont-Doherty Earth Observatory of Columbia University

In this paleoclimate study we want to understand if iron and hematite (a common iron oxide mineral found in mud layers) can be used as a proxy for climate change. From the iron and hematite data we want to find indications that relate to Milankovitch cycles and monsoons. Through the use of scanning x-ray fluorescence by an Itrax core scanner, we measured the iron composition throughout different stratigraphic depths in the Late Quaternary VM 30-40 marine sediment core. Another method used was the collection of relative hematite concentrations from the Late Traissic PFNP-1A sediment core, with a varian cary 50 spectrophotometer fitted with a diffuse reflectance sensor (DRS). The DRS hematite data is compared to CIE color data provided by the LacCore National Repository of the University of Minnesota. From the VM 30-40 data, bivariate plots indicate three potential sources from which the terrigenou fraction of sediment in the was delivered to the eastern equatiorial Atlantic from Africa. Linear regression plots indicate that other continental elements found in the marine core increase with iron. Spectral analysis of the iron data was used to define a precession signal through the first ~4 m of core depth. From the PFNP-1A core data a change in hematite concentration can be observed, as well as a change in the Red-Green/Blue-Yellow CIE data, and indications of the ~405 kyr eccentricity cycle were identified. From the results it can be seen that changes in Milankovitch cycles can influence monsoonal winds, making them more wet when the eccentrical cycle is at its peak and dry when the cycle is at its weakest. The same can be said for the precession cycle found throughout the VM 30-40 core. These two indications of Milankovitch cycles can support iron and hematite as being possible proxies for climate change. The importance of understanding if iron and hematite can be used as climate proxies, can help reconstruct paleoclimates, as well as understand possible changes that climate has had in past life and the monsoons of Earth.