To What Extent Are Catastrophic and Environmental Events Useful Stratigraphic Markers for Dating the Hudson River: The Impact of Manganese Cycling, Zebra Mussels and the Peekskill Meteorite?

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Given the difficulty in dating the Hudson River through radiocarbon dating, we studied the efficacy of using significant environmental events as stratigraphic markers. The environmental impacts of manganese cycles, the Peekskill meteorite, and/or zebra mussels were observed in Hudson River cores CDO2-29, LWB1-8, LWB3-44 and LWB4-5. The manganese cycles are a yearly occurrence, during which the Mn content is higher in the spring than it is in the fall. Using an ITRAX XRF scan we identified where the peaks in Mn were to determine the years along the core. We found that for core LWB3-44 sediments at 9 cm were deposited in 1992, for LWB4-5 1992 was at 9.6 cm. Manganese peaks allows researchers to quickly date along the core, within 1 year in the last 65 years. We also studied the changes produced in deposited sediments by the Peekskill meteorite, which landed on October 9th, 1992. We found a core (LWB4-5) that was taken within 0.75 km of the projected track of the meteorite over the Hudson River, with the highest magnetic susceptibilities we observed in a Hudson core. Core LWB4-5 had a high magnetic susceptibility reading at 12cm that occurred around 1992. The high magnetic susceptibilities continue down to 31 cm depth, the location of a possible large fragment of the Peekskill meteorite. Core LWB3-44 also had a higher magnetic susceptibility at after its 1992 year, compared to surrounding sediments, but the susceptibility of LWB4-5 changed to 10 times its original value. In addition to changes in magnetic susceptibility of the core tektite shaped particles, and grains containing >1 wt.% nickel, supporting the theory that the change in magnetism was produced by an extraterrestrial impact. Using an event that only affects the already deposited sediments is useful in areas that are difficult to date, although it does not offer detail beyond an inferred boundary date. Conversely, we hypothesized that the zebra mussel invasion of the Hudson in 1991/1992 would change the composition of Hudson River sediments deposited afterwards. Papers have stated that after the zebra mussel invasion, the population of phytoplankton decreased, we can also assume that this would have lead to a decrease in organic matter content and foraminifera population. Organic matter content was found using the Loss-On-Ignition technique for cores LWB3-44 and LWB4-5. The change in foraminifera was studied through calcium carbonate, as their shells are composed of this. We found the calcium carbonate concentration using both the LOI technique for LWB4-5 and a coulometer for CDO2-29 AND LWB1-8. We hoped to find a significant decrease in Hudson River organic matter and foraminifera after 1992. The organic matter and calcium carbonate content remained close to or within average along the core. As a result, we concluded that the

zebra mussel invasion did not significantly impact the river's organic matter or $CaCO_3$ concentration. We are continuing our study on the usefulness of the zebra mussel invasion as a stratigraphic marker, by examining the change in the biogenic silica content of the sediments at the 1991/1992 interface, and the accumulation of metals in the core.