# 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 Hudson River sediments by radiocarbon dating, we studied the efficacy of using significant environmental events as stratigraphic markers. We studied the environmental impacts of manganese cycles, the Peekskill meteorite, and/or zebra mussels in Hudson River cores CDO2-29, LWB1-8, LWB3-44 and LWB4-5. The manganese cycles are yearly; the Mn content is higher in the spring than in the fall. Using an ITRAX XRF scan we counted the number of peaks in Mn with increasing depth, thus estimating the elapsed years since the core was taken. This method allowed us to date the core to within 1 year in the last 65 years. In core LWB3-44 1992 was at 9 cm; in LWB4-5 1992 was at 9.6 cm. We also studied changes from the Peekskill meteorite, which landed on October 9$^{th}$, 1992. We found a core (LWB4-5) taken within 0.75 km of the projected track of the meteorite over the Hudson River, with the highest magnetic susceptibility layer we ever observed in a Hudson core. Core LWB4-5 had a high magnetic susceptibility layer from 12 to 31 cm depth. The top at 12 cm dates to around 1992. The base at 31 cm depth contains possible denser fragments of the Peekskill meteorite. The maximum susceptibility of LWB4-5 is 10 times its average value. Within the high susceptibility layer, we found tektite shaped particles, and Fe-rich grains containing >4 wt.% Ni and no Cr, supporting the theory that the peak in susceptibility was produced by an extraterrestrial impact. Core LWB3-44 also has a layer of slightly higher magnetic susceptibility at the 1992 level. We hypothesized that the zebra mussel invasion of the Hudson in 1991/1992 would change the composition of Hudson River sediments. After the zebra mussel invasion, the population of phytoplankton decreased. Diatoms were most affected. This could have lead to decreases in organic matter content and biogenic silica. We found organic matter content using the Loss-On-Ignition technique for cores LWB3-44 and LWB4-5. The organic matter content did not change significantly down core. We conclude that the zebra mussel invasion did not significantly impact organic matter as a whole. It may have affected the subset of organic matter that originated as chlorophyll. 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. We are also studying the accumulation of metals in the core.