Magnetic Susceptibility Profiles From Lake Ronkonkoma: A Pilot Environmental Magnetic Study

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The study of stratigraphic variations of magnetic parameters in recent and post-glacial lake sediments is emerging as a useful tool for studying changes in catchment erosion and sedimentation processes, climate variation, and anthropogenic atmospheric deposition. As a pilot study to apply the techniques of environmental magnetism to study the recent depositional history in Lake Ronkonkoma six sediment cores ranging in thickness from 23 cm to 47 cm were collected across Lake Ronkonkoma. The cores were collected from canoe in waters ranging in depth from about 2.5 to 4 m. The split cores were sampled continuously using 2 cm ODP style sample boxes. After magnetic measurements were completed boxes were opened and samples were placed on a warming plate for a week to dry. Then samples were weighed.

Most cores are dominated by sands with some organic rich mud at the top. One core near the north end of the lake is mostly organic mud, presumably derived from the stream draining the wetland basin north of the lake. Two cores, one off the southwest shore and one in the north central part of the lake, contain a pebbly layer below 25 cm sub-bottom depth. The pebble layers suggest that during the past several hundred years either the lake level and local groundwater were more than 3 meters lower than at present due to drought or that an unusual depositional event washed coarse sediments into the middle of the lake, perhaps as a winter storm deposited gravel on top of marginal ice which later drifted into the middle of the lake before melting.

Study of the magnetic characteristics was conducted in the paleomagnetics lab at Lamont-Doherty Earth Observatory. Measurements were made of the natural remanent magnetization (NRM) and low-field magnetic susceptibility (k). Anhysteretic remanent magnetization (ARM) was imparted in an alternating field of 200 mT with a bias field of nominally 0.1 T. The acquisition of isothermal remanent magnetization (IRM) was imparted up to a peak field of 2.5 T. Backfield IRMs were imparted to -0.3 T. Mass specific susceptibility, ARM, and IRM were calculated.

Initial results show that mass specific susceptibility, SIRM, and ARM are strongest at the tops of all cores indicating that deposition of strongly magnetic particles has increased in recent times. This suggests anthropogenic factors such as atmospheric deposition of magnetic spherules formed as combustion products. SIRM and ARM decline to low values downcore. Susceptibility follows the same pattern in most cores, but two cores show more downcore variation indicating some differences in sedimentary processes in the lake. ARM/SIRM profiles yield good correlations between the two longest cores and plausible correlation with the remaining cores.