

Grain-Size Analysis and Provenance of Long Island Loess

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Loess in a three-foot thick section on the SUNY Stony Brook Campus has been studied for grain size distribution and the provenance of the loess. The loess provenance has been evaluated using single crystal $^{40}\text{Ar}/^{39}\text{Ar}$ mica ages. The grain size distribution shows an abnormal pattern, with peaks at fine sand (250 microns), silt (20 microns), and clay (<2 microns). There are also occasional pebbles up to 5 cm in diameter in the loess. The size distribution of the clay and silt fractions of the sediment resembles that of loess in many parts of the world. The size distribution of the fine sand in the loess resembles that of the immediately underlying 6 " thick glacial sand unit and the sand in the underlying gravely till. We proposed that sand in the loess on Stony Brook campus may be wind blown sand or derived from the underlying sand and till by the combined action of cryoturbation and faunalturbation.

Mica ages have been measured in a section from Caumsett State Park, Lloyd Harbor, New York that includes both Cretaceous and glacial sediments. These ages were then compared with the ages found for mica in the loess on campus. The muscovite ages in loess range between 250 to 375 Ma and are similar to those found for the muscovite in the Cretaceous sand. Biotite was not found in the Cretaceous sands, but was found in the overlying glacial sands and gravels at Caumsett State Park. The reason for this is probably that biotite cannot withstand the extensive weathering or recycling that the sand in the Cretaceous sediments have undergone prior to deposition. The biotite in the glacial sediments is probably more dominantly derived from freshly glacially scoured local basement rocks.

The ages for the biotite from the glacial sediments are mainly 250 to 400 Ma consistent with their derivation from the basement rocks underlying Long Island Sound or exposed in southern Connecticut. Ages for biotite from the loess range from 44 to 1287 Ma with the majority between 250 to 400 Ma. These mica ages suggest that the majority of the loess is of local origin and that the muscovite and biotite are derived mainly from sources similar to the underlying Cretaceous and glacial sediments. Some of the biotites have an age of about 800 Ma consistent with derivation of these biotites from Grenville sources further to the west in the Hudson or New Jersey Highlands. The 44 Ma and 1287 Ma biotite ages have to have a source much further to the west, perhaps even from the Rocky Mountains.