Accelerator Mass Spectrometry: Techniques for Measurement of Long-Lived Radionuclides and Applications

Marc W. Caffee

Purdue University, Department of Physics and Astronomy and Department of Earth, Atmospheric, and Planetary Sciences

* *e-mail: mcaffee@purdue.edu*

Accelerator mass spectrometry enables the measurement of rare radionuclides, such as ^{10}Be, ^{14}C, ^{26}Al, ^{36}Cl, ^{41}Ca, and ^{129}I. Most of these radionuclides can be produced by cosmic-ray interactions with both extra-terrestrial and terrestrial materials. Some are also produced by nucleogenic processes. The measurements of these radionuclides yield information about the exposure conditions and durations. Measurements of terrestrial cosmic-ray produced (cosmogenic) nuclides provide information on glacial chronologies, erosion rates, burial ages, even hominid evolution. Measurements of cosmogenic nuclides Measurements of cosmogenic nuclides in extra-terrestrial materials provide meteorite exposure ages and information about lunar and asteroidal surface processes.

Be-10 and ^{26}Al have been measured from core samples taken from underneath the Greenland Ice Sheet (GIS) GIS near the dome of the ice sheet and from sediments collected underneath the ice at Camp Century. These measurements can be used to develop scenarios for the extent of the ice sheet during the later Pleistocene and indicate that the GIS is a dynamic feature that has undergone considerable change during the Pleistocene, and is likely to continue changing, perhaps having profound influence on coastal regions.

While measurements of radionuclides from terrestrial samples provide important information on the connections between climate and Earth's evolving landscape, measurements in extra-terrestrial materials provide information about the nature of Earth's solar system environment. Recent measurements of lunar and asteroidal samples evince dynamic processes on their surfaces.