Abstract

Depth Variation of Cosmogenic Nuclides
in a Lunar Surface Rock

by


Two pieces of lunar rock 12002 were divided into depth fractions nominally 0-1, 1-2, 2-4, 4-9, 9-20, 20-60, and ~60 mm depth below the upper surface. Depth profiles of short- and long-lived radionuclides were obtained by analyzing these fractions. Effects of solar particle bombardment are visible down to the 9-20 mm fraction and may extend deeper. Very high values (730 dpm/kg for Fe$^{55}$, 530 dpm/kg for Co$^{56}$) are observed in the top layer.

The comparison of short- and long-lived activities can be made in much more detail with these data than was previously possible. The closely parallel profiles of 2.6 yr Na$^{22}$ and 7.4x10$^{5}$ yr Al$^{26}$, produced by similar reactions, permit a firm inference that the flux and spectral shape of the solar particle spectrum averaged over 10$^{6}$ years has been similar to that observed recently. The model developed by Shreiddalff and extended by Reedy and Arnold is used to calculate fluxes and spectra for various periods.

It was necessary to assume some surface erosion in order to fit the profiles of the 2x10$^{6}$ yr Mn$^{53}$ to the calculations.