CAN COSMIC-RAY NUCLEON MEASUREMENTS BE USED TO SCALE PRODUCTION RATES OF COSMOGENIC NUCLIDES?

DESILETS, Darin[1], **ZREDA, Marek**[1], and RADHAKRISHNAN, Venkataraman[2], (1) Hydrology and Water Resources, Univ of Arizona, Tucson, AZ 85721, marek@hwr.arizona.edu, (2) Raman Research Institute, Bangalore, India

Before cosmogenic dating methods can be applied with confidence, we must understand the spatial variability of nuclide production rates on the earth's surface. Direct measurements of cosmic-ray fluxes have commonly been used to ascertain the spatial variability of production rates, but the relation between spatial variations of cosmic-ray neutron intensity and production rates of in-situ cosmogenic nuclides remains unclear. We address this problem by comparing neutron measurements with measurements of cosmogenic isotopes over a large range of altitudes. We conducted airborne and ground-based neutron monitor measurements at Bangalore, India (RC=17.2 GV). Our measured attenuation lengths of 147±2 (altitudes 0-2300 m) and 156±1 g cm^{-2} (2,300-5,300 m) are consistent with previous neutron monitor measurements. These results allow for the extension of the neutron scaling model of Desilets and Zreda (2003, Earth and Planetary Science Letters 206, 21-42) to 17.2 GV, which is nearly the highest cutoff rigidity in the current geomagnetic field. To compare our new neutron scaling model with cosmogenic nuclide production rates, we measured an altitude profile of ^{36}Cl inventories in lava flows on Mauna Kea, Hawaii (RC=12.8 GV). The attenuation length of 139±9 g cm^{-2} is consistent with the value of 142±1 g cm^{-2} calculated from our neutron-monitor scaling model. The agreement between neutron and nuclide attenuation lengths suggests that scaling functions derived from modern measurements of neutron intensity can be extended to isotopic systems and to geological time.

Citation:

Desilets, Darin, Marek Zreda and Venkataraman Radhakrishnan, 2003, Can cosmic-ray nucleon measurements be used to scale production rates of cosmogenic nuclides?, XVI INQUA Congress, Reno, Nevada, 23-30 July 2003, Abstracts with Programs, Abstract 56-8, p. 174.