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THE COSMIC RAY PRODUCTION OF ^{37}Ar, ^{39}Ar AND TRITIUM IN THE LUNAR SOIL. R. W. Stoenner, Richard M. Lindstrom, Warren Lyman and Raymond Davis Jr. Brookhaven National Laboratory, Upton, NY 11973.

The 35-day ^{37}Ar, 269-year ^{39}Ar and 12.6-year tritium radioactivities were measured in two Apollo 14 surface fine samples by a vacuum melting and extraction procedure. The results are as follows: 14259,84 - 78.2 $\pm$ 3.4 dpm ^{37}Ar/kg and 9.11 $\pm$ 0.54 dpm ^{39}Ar/kg; 14163,116 - 46.4 $\pm$ 3.4 dpm ^{37}Ar/kg, 10.15 $\pm$ 0.58 dpm ^{39}Ar/kg, and 203 $\pm$ 4 dpm tritium/kg. The ^{37}Ar observed in these samples is higher than observed in previous missions, and will be interpreted in terms of bombardment cross sections and K, Ca, Ti and Fe contents of the samples.

Two pairs of Apollo 15 samples were measured to obtain the production rate of ^{37}Ar, ^{39}Ar, and tritium as a function of soil depth. One pair of samples was the surface (15041,16) and bottom (15031,16) of a trench approximately 40 cm deep. A second pair of samples were a surface sample (15221,17) and a sample taken below a 1 meter diameter boulder (15231,18). The pair of samples from the trench were heated in stages 300°C, 600°C, 900°C and melted to observe the diffusion of these radioactivities from the soil samples. The samples from the boulder location were held at 150°C for sufficient time to observe the emanation of ^{222}Rn, and the diffusion loss of tritium. Following this 150° heating, these samples were melted to release the argon, radon, and tritium radioactivities. The argon radioactivities were found to be released at temperatures exceeding 600°C. The results will be interpreted in terms of a thick target of simulated lunar material bombarded with 600 MeV protons.