

COSMIC RAY PRODUCED RADIOISOTOPES IN APOLLO XII
AND APOLLO XIV SAMPLES.

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A sample of lunar fines 12001 was separated into two different grain size fractions, the finest ($< 45 \mu$) showing a significant enrichment in feldspar and, hence, different contents of target elements relevant for the production of ^{22}Na , ^{26}Al , ^{36}Cl , and ^{39}Ar . The samples were decomposed and the activities determined using the same procedures as described for Apollo XI. Data for the relative contributions (to the total activities) by the different target elements will be presented.

Furthermore, a slice of rock 12053 was divided into three depth fractions. A top layer (0-5 mm) was taken from that segment of the slice which, judged from the presence of micro-craters, had been exposed to free space. Care was taken not to lose the very outermost layer. ^{14}C and ^{39}Ar were measured in this layer, in the two other ones ^{22}Na , ^{26}Al , and ^{36}Cl as well. ^{22}Na and ^{26}Al were determined before decomposition of the samples, employing a large volume Ge(Li)-detector, as well as after a chemical separation of the pure elements. The activities of ^{36}Cl and ^{39}Ar are rather invariant with depth, ^{22}Na and ^{26}Al exhibit the by-now well established depth dependance, which is shown here to exist for ^{14}C as well (Table 1).

depth	dpm $^{14}\text{C}/\text{kg}$
0 - 5 mm	72.4 ± 7
5 - 20 mm	32.8 ± 3
20 - 65 mm	29.7 ± 3

Using the model calculations of REEDY and ARNOLD the steep slope corresponds to a value of $R_0 \approx 80 \text{ MV}$, but a flux of around 500 protons $\text{pro cm}^2 \text{ sec}$. As this flux value is unreasonably high as compared to the results of ARNOLD and co-workers from the analysis of radioisotopes with half-lives between 2.6 years and 4 Myr., it appears that part of the

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excess ^{14}C in the top layer has to be accounted for in a different way. A possible explanation would be that it was contained in the solar wind, which would require a ratio $^{14}\text{C}/\text{H} \approx 6 \times 10^{-12}$. Assuming this ^{14}C to be produced on the sun by "thermal" neutrons via the $^{14}\text{N}(\text{n},\text{p})$ -reaction leads to a flux of $\Phi \approx 7 \times 10^5$ neutrons/cm² sec. It is suggestive that using this flux a ratio $^3\text{H}/\text{H} \approx 2.5 \times 10^{-10}$ for the solar wind would be predicted from the $^3\text{He}(\text{n},\text{p})^3\text{H}$ -reaction, which agrees within a factor of 5 with what has been suggested by FIREMAN and co-workers in order to explain an excess of tritium in the surface of rock 12002.

Finally, in the two soil samples 14163 and 14259, which are different by about a factor of two in their ^{22}Na and ^{26}Al activities, ^{36}Cl and ^{39}Ar were measured, too. Owing to the rather high K-content of approximately 4000 ppm of these samples practically all ^{39}Ar is produced via the $^{39}\text{K}(\text{n},\text{p})$ -reaction, induced by neutrons with energies above 1 MeV. Flux values for "lunar" neutrons in this energy range will be given for both samples.