BERYLLIUM-10 AND ALUMINUM-26 CONTENTS OF LUNAR ROCK 74275;

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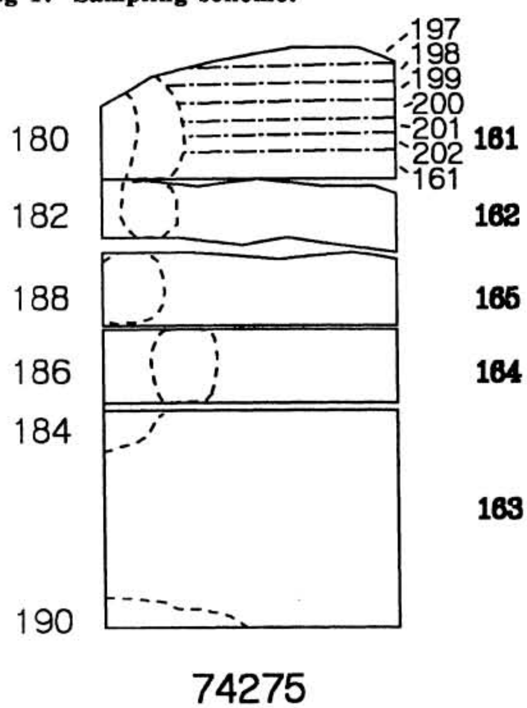
Lunar rock 74275, a high-titanium basalt, was collected on the rim of Shorty crater [1]. Fruchter et al. [2] identified it as suitable for a detailed study of cosmogenic nuclides on the basis of its size (5x12x15) cm and the known, relatively flat orientation of its upper surface. We have measured by accelerator mass spectrometry [3, 4] the depth profiles of ^{10}Be and ^{26}Al in this rock. We focused on near-surface samples in order to search for the possible effect of solar cosmic rays on ^{10}Be production. The ^{26}Al profile was of interest as a check of methodology and an anchor for estimates of the recent flux of solar cosmic rays at the site. Figure 1 shows schematically the locations of the samples studied. The topmost slabs, 161-191, were sawed from 161. Roughly 0.5 mm/slice was lost in cutting.

Fig 1. Sampling scheme.



The experimental results are given in Table 1 and plotted in Figures 2 and 3. Each range of depths for a sample was converted to an "average" depth by multiplying the midpoint of the range by the bulk density, ρ, of 3.36 g/cm^2 [8]. As we added no Al carrier, we had to determine the native Al contents of the samples. We did so by using DCP emission spectrometry. Analysis of 26 samples gave results ranging from 4.5 to 5.4 with an average of 4.93 ± 0.20%. We used the average in all cases. Aluminum contents from 4.3 to 4.7 are reported in the literature [5-7]. Our ^{26}Al contents are consistent with those reported by [2] (Fig 2).

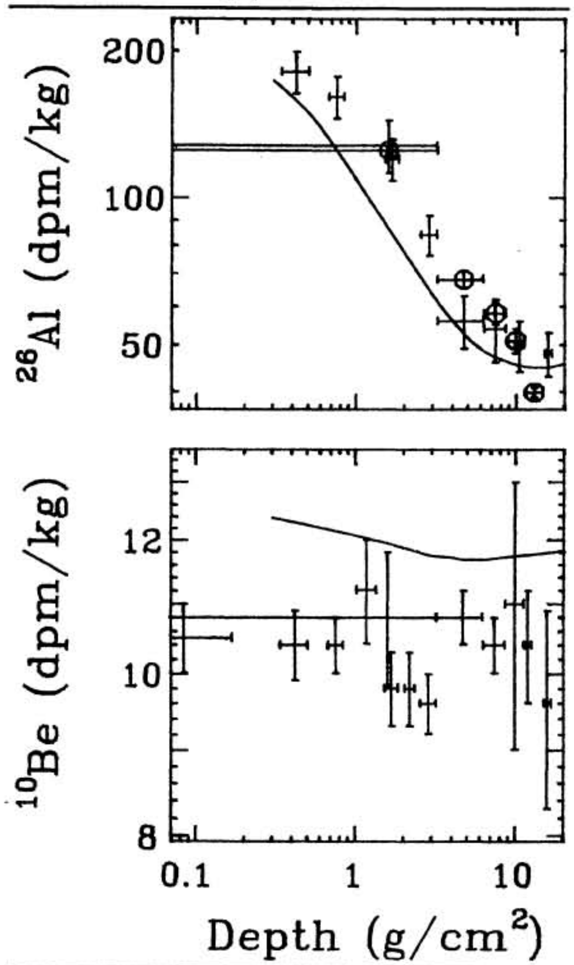
Figures 2 and 3 show as lines production rates (P) for basalt 74275 calculated by R.C.Reedy assuming J=70, R_0=100, and no erosion. These parameters reproduce fairly well P_{26} in lunar rock 68815 [9] but not P_{10} [10]. To compare our results with Reedy's we must take account of two effects. Basalt 74275 spent the last 2.8 Ma at the lunar surface subtending a solid angle of 1.8π and the previous 20 Ma at a depth of 40 g/cm^2 [11, 12]. Fortuitously, one correction factor equal to 1.20 converts both the ^{10}Be and the ^{26}Al contents to production rates. The increase makes the measured and calculated values of P_{10} agree although the uncertainties are 1-2 dpm/kg depending on the error assigned to the surface exposure age. On the other hand, the increase exacerbates a discrepancy between the calculated and measured ^{26}Al production rates in the shallowest material. Offsets in the sampling depth cannot readily explain the differences: Even if we discount the corrections above a discrepancy persists. It could be removed by 1) increasing the intensity or the rigidity of the SCR flux (but see [10]; 2) lowering ρ or the adopted Al content (but see [2]).

Conclusions: Our measured ^{10}Be profile is flat within experimental errors. We cannot rule out a small (1 dpm/kg) contribution from solar cosmic rays, however. Calculations that explain the P_{26} profile in near-surface samples from lunar rock 68815 do not account for the observations in rock 74275. The shielding independence of ^{10}Be production down to depths of 15-20 g/cm^2 in the moon and the relative insensitivity of P_{10} to composition make the isotope a good one for determining surface exposure ages up to 4 or 5 Ma.

Table 1. ^{10}Be and ^{26}Al contents of 74275.

Sample	Depth mm	Depth g/cm^2	^{10}Be dpm/kg	^{26}Al dpm/kg
197	0-0.5	0.08	10.7±0.5	
			10.3±0.5	
Mean			**10.5±0.5**	
198	1.0-1.5	0.42	10.4±0.5	187±19
			10.4±0.6	175±18
Mean			**10.4±0.5**	**181±18**
199	2.0-2.5	0.76	10.4±0.4	156±16
			10.4±0.5	167±17
Mean			**10.4±0.4**	**161±16**
200	3.0-4.0	1.18	12.0±0.5	
			10.5±0.5	
Mean			**11.2±0.8**	
201	4.5-5.5	1.68	10.1±0.5	119±12
			9.5±0.4	120±12
Mean			**9.8±0.5**	**120±12**
202	6.0-7.0	2.18	9.9±0.6	
			10.4±0.5	
Mean			**10.2±0.5**	
161	7.5-9.5	2.86	9.3±0.4	85±9
			9.8±0.4	82±8
Mean			**9.6±0.4**	**84±8**
180	0-9.5	1.6	9.8±0.7	128±16
			11.9±0.5	
Mean			**10.8±1.0**	
182	9.5-18.5	4.7	10.7±0.8	56±7
			11.0±0.4	
Mean			**10.8±0.4**	
188	18.5-25.5	7.4	10.2±0.7	54±8
			10.7±0.4	
Mean			**10.4±0.4**	
186	25.5-33.5	9.9	9.4±0.7	
			13.0±0.5	
Mean			**11±2**	
184	33.5-37.5	11.9	10.9±0.8	51±6
			9.8±0.3	49±5
Mean			**10.4±0.8**	**50±6**
190	44.5-49.5	15.8	8.4±0.6	50±5
			10.7±0.4	46±5
Mean			**9.6±1.3**	**48±5**

Figs. 2 and 3. ^{26}Al and ^{10}Be *vs.* depth. Circles from ref. [2].



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