THE RIM OF NORTH RAY CRATER: A RELATIVELY YOUNG REGOLITH, J.L. Jordan, J.R. Walton, D. Heymann, S. Lakatos, Depts. of Geology and Space Physics, Rice University, Houston, Texas 77001.

Cosmogenic Ne-21 contents of 9 single particles (500-1000μm) from 67701 range from 1 to 7 Paneth (1) with an average value of 4.0 Paneth. The cosmogenic Ne-21 contents of 6 size fractions from 67701 range from 3.4 to 5.4 Paneth with an average value of 4.2 Paneth. In contrast, the cosmogenic Ne-21 contents of size fractions from 61221 and 61241 show averages of approximately 45 Paneth. From this we conclude that the thin soil cover at Station 11 comes essentially from only one source: N.R. Crater ejecta, with little contamination by materials from elsewhere. The age of N.R. Crater has been reported as about 50 myr (2) and as about 30 myr (3). The Ne-21 production rate inferred from the first age of 0.08 Paneth per myr is at least one-half the expected rate. The second age gives production rates more in line with the expected value. We have considered the following explanations for this paradox:

<u>a</u> The age of N.R. Crater is 50 myr. The regolith at Station 11 contains some debris from this time. However most of the rocks and the soil at Station 11 come from a younger crater (younger than 30 myr) nearby,

<u>b</u> The survival time of <1 mm particles in a soil cover of a few cm is substantially less than 50 myr,

<u>c</u> The low Ne-21 production rate is a "memory" of shielding in relatively large boulders for millions of years.

The over-all trapping efficiency of the soil cover, assumed 5 cm thick, for solar-wind He-4 is only 0.0003. This implies that the thin cover had been "saturated" with trapped He-4 on a time-scale of ten thousand years. An alternative interpretation is that the rim of N.R. Crater has always been an active <u>erosional surface</u>. An initial soil thickness of several meters, whittled down to a few cm in 50 myr would bring the over-all trapping efficiency of solar-wind He-4 more in line with previous estimates and would alleviate the problem (4).

Table 1 gives n-values for 67701, 61221, and 61241 together with Ne-21 ages, agglutinate contents (5) and mean grain size(5). There is no correlation between n and any of the other entities, which shows that n-values cannot be used as an index of maturation of a soil. Comparison of Ne-21 ages, agglutinate contents, and gas-loading (number of trapped gas atoms per cm^2 of surface)

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are indicative of the residence time of a soil in an upper, active zone of the regolith, perhaps only a few mm thick. The rate of agglutinate production and gas loading decreases rapidly with depth, but Ne-21 production is still substantial at one meter depth (6).

The n-values in Table 1 are all less than unity. We conclude that this reflects mainly a substantial and continuous production of fresh, unexposed (to solar wind) surfaces. We do not know whether the grain-size distribution of 67701 has reached a steady state, but if it has, then the rate of production of fresh unexposed surfaces, when expressed as $R=kD^{-p}$ (R=rate, k=proportionality constant, D=particle diameter) must be such that p is greater than 1, because the specific surface area is proportional to D. This, in turn, would seem to imply that the mean lifetime against rupture of particles <1 mm depends strongly on particle size. For a simple model, in which the mean lifetimes are proportional to $D^{\underline{q}}$, we calculate from the n-values in Table 1 that the mean lifetime of particles in 67701, 61221, and 61241 decreases roughly by a factor of 5 for a decrease by a factor of 10 in diameter.

The fines from the trench at Station 1: 61221 and 61241 are definitely not N.R. Crater ejecta. Their cosmogenic Ne-21 contents show that these fines have been on the surface much longer than 50 myr. Fines 61221 are unique in at least one respect. Its trapped gas content decreases normally with increasing grain size until about 150 μm, then increases significantly up to 1 mm. These fines seem to contain a relatively gas-rich, coarse-grained component. The origin of this component is still undetermined.

(1) The unit "Paneth" is 10^{-8} cm^3 STP/g.
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Table 1

n-values $C_D = S(D/D_o)^{-n}$, Ne^{21} exposure ages, agglutinate contents, and mean grain size.

Sample	$n(Ne^{20}_T)$	Ne^{21}_c-age myr	Agglutinate content %(4)	Mean grain size μm(4)
67701	.72	25	15.6	91
61221	.69	250	6.3	66
61241	.70	250	27.1	70

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