SPATIAL NON-HOMOGENEITY AND TEMPORAL VARIABILITY IN THE EMANATION OF RADON FROM THE LUNAR SURFACE: INTERPRETATION, Paul Gorenstein, Leon Golub, and Paul Bjorkholm, American Science and Engineering, Cambridge, Massachusetts.

Global observations of lunar radon with the Alpha Particle Spectrometer aboard the orbiting CSM of Apollo 15 and Apollo 16 have resulted in a number of features relating to the spatial distribution of radon emanation upon the lunar surface and have established time variability as an important characteristic of this process.

Two of our most highly localized features are "hot spots", concentrations of ^{222}Rn and her comparatively long-lived descendent ^{210}Po in the vicinity of the craters Aristarchus and Grimaldi. In the case of both craters the increase above the local background requires considerably higher radon emanation rates than the lunar average. Both Aristarchus and Grimaldi are cited in historical records as centers of transient lunar phenomena (TLP). Thus the Apollo results provide evidence for an association between TLP regions and radon hot spots. The crater Tsiolkovsky on the lunar far side appears to be the location of another hot spot although the counting statistics are not as compelling as in the case of Aristarchus and Grimaldi. Thus Tsiolkovsky is a candidate for being a potential TLP region.

In addition to these highly localized features, the Apollo 15 results suggest the following gross characteristics in the ^{222}Rn distribution. The largest count rates are found in the frontside western quadrant of the Apollo 15 groundtrack containing Mare Imbrium and Oceanus Procellarium even when the Aristarchus region is excluded. The next highest count rates occur in the eastern quadrant containing the smaller maria and the lowest count rates are found over the highland regions. This large scale inhomogeniety has two possible interpretations. One, it may be related to differences in the concentration of uranium in the lunar regolith. Two, it may be explained by the model of radon diffusion of Heymann and Yaniv (1), who predict an accumulation of ^{222}Rn at the sunrise terminator which was in the western maria during Apollo 15.

Another significant result is the detection of ^{210}Po at various locations that exceed the equilibrium value (as determined from ^{222}Rn) by an order of magnitude. Our global observations establish unambiguously that lunar radon emanation has a strong time dependence as well as a spatial dependence. The ^{210}Po records imply much larger emanation rates on one or more occasions during the past 21 years than the rates observed during Apollo 15 and Apollo 16. This may explain at least some of the large discrepancy between determinations of ^{210}Po at different locations and at different times. Another interesting result is the observation of larger concentrations of ^{210}Po at the edges of the maria, in particular the Sea of Fertility. The "edge effect" appears to effectively rule out models in which radon emanation results from meteorite bombardment.