PARENTLESS RADIOGENIC NOBLE GASES IN LUNAR SOILS: EVIDENCE FOR PLANET POLLUTION OF THE SUN? Ozima M. (Graduate School of Earth and Planetary Science, University of Tokyo, Tokyo, Japan; *EZZ03651@nifty.ne.jp*), Miura Y.N. (Earthquake Research Institute, University of Tokyo, Tokyo, Japan), and Podosek F.A. (Department of Earth and Planetary Sciences, Washington University, St Louis, MO63130, USA).

Noble gases in the solar wind (SW), especially in their isotopic compositions, are generally regarded to be good proxies of solar noble gases, i.e. the primordial noble gases in the solar system. Lunar soils and soil breccias have been extensively studied as a means to investigate SW compositions, since many soils have been exposed to the SW long enough to accumulate substantial concentrations of noble gases, enough for precise isotopic analysis. However, laboratory analyses have clearly shown that noble gases in lunar breccias include excess (parentless) radiogenic components such as ^{40}Ar, ^{129}Xe and fission Xe [1-3] that are not thought to be attributable to the SW. Therefore, these parentless radiogenic components have been assigned a lunar origin: Radiogenic components produced in the lunar interior were degassed to the transient lunar atmosphere, and some of these degassed noble gasses were re-implanted to the lunar surface together with SW [4-6].

This degassing hypothesis requires an uncomfortably high degassing rate of radiogenic noble gases from the lunar interior, and if it is truly responsible for the parentless radiogenic noble gases in lunar soils, it imposes significant constraint on the evolution of the Moon. The degassing hypothesis has been commonly accepted, since there has not been a plausible alternative hypothesis. Here we consider the implied rate of degassing from the lunar interior, conclude that it is too large to be tenable, and advance an alternative suggestion for the source(s) for the parentless radiogenic noble gases.

The recent exciting discoveries of extrasolar planetary systems [7] lead to a suggestion that the central star of a planetary system may be "polluted" by absorption of planets or planetesimals, thereby increasing the metallicity of the star [8]. (Here and below we use "metal" in the astronomical sense, as designating all elements heavier than He.) If the planet is volatile-deficient specifically if it is deficient in H and He, the pollution effect will increase the star's metallicity. For most elements, there would still be no effect on isotopic composition. But *radiogenic* noble gas isotopes such as ^{40}Ar, ^{129}Xe, ^{244}Pu-fission Xe will be relatively enriched in a volatile-depleted planet because they were initially trapped in solid planetary bodies as metallic parent elements ^{40}K, ^{129}I, ^{244}Pu. For these isotopes, absorption of a planet can lead to changes in relative isotopic abundance.

To examine the effect of planet pollution on the SW, we compared an outgoing noble gas flux in SW with the rate of noble gas pollution into the Sun. We will show that if the Sun was polluted by planetary materials of about two Earth masses as suggested by Murray et al. [9] and the pollution has lasted over a few hundred millions of years, the polluting noble gases (*radiogenic components*) flux would become comparable with the outgoing noble gases in the SW. Therefore, planet pollution may become important in ^{129}Xe and fission Xe, and may provide a reasonable alternative explanation for the parentless radiogenic ^{129}Xe and fission Xe observed in lunar soils. The observation [2, 3] that parentless radiogenic noble gases are more abundant in older lunar soils may support the above argument, since planet pollution was likely to be more intense in the earlier solar system. However, excess ^{40}Ar in lunar soils appears to be too large to be attributable to planet pollution alone.

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