^{244}Pu AND EARLY SOLAR SYSTEM CHRONOLOGY. M. Peto and S. B. Jacobsen, Department of Earth and Planetary Sciences, Harvard University, 20 Oxford St. Cambridge, MA 02138, USA (mpeto@fas.harvard.edu).

Introduction: While there is clear evidence for the presence of ^{244}Pu ($t_{1/2}$ = 82 Myr) in the early Solar System its initial abundance is still uncertain. The most frequently quoted value ^{244}Pu /^{238}U in terrestrial xenology is ($7 \cdot 10^{-3}$) [1,2]. However, the geochemical and cosmochemical behavior of Pu is more similar to Nd than to U, so it was realized early on that referencing its abundance to ^{238}U could lead to significant error in initial abundance estimates. Therefore data acquired on angrite and eucrite meteorites has been referenced to Nd instead of U. These meteorites suggest an initial solar ^{244}Pu = $4 \cdot 10^{-3} \cdot {}^{238}$U [2,3] when recalculated relative to the initial solar Nd/U ratio. Here, we reevaluate these data to infer the best initial ^{244}Pu abundance for the early Solar System at 4567 Myrs ago. We also discuss the effect of this re-evaluation on the interpretation of early atmospheres and late veeners on Earth and Mars.

Data and Models: Our re-evaluation suggest that the low ^{244}Pu /^{238}U value of $4 \cdot 10^{-3}$ is the correct estmate. This effectively moves all estimates based on the ^{244}Pu-$^{131\text{-}136}$Xe chronometers to earlier times. In particular, this suggests early atmosphere formation (<30 Myr) for a simple model where the atmosphere forms by degassing of the interior. However, the likely late veneer addition complicates this. It is possible that the difference between the Earth's atmosphere and mantle only reflects the difference between the ^{244}Pu/^{130}Xe ratio of the late veneer and the mantle. The lower initial ^{244}Pu abundance of the Earth will also require less degassing of Earth's mantle than inferred with the currently referenced higher value.

References:

[1] Hudson G. B., Kennedy B. M., Podosek F. A., Hohenberg C. M., 19th LPSC, 547 [2] Hagee B., Bernatowicz T. J., Podosek F. A., Johnson M. L., Burnett D. S., (1990) *GCA* 54, 2847 [3] Marti K., Lugmair G. W. (1977) *EPSL*, 35, 273 [4] Jones J. H. (1982) *GCA*., 46. 1793