A single piece of 9.6 kg of a IIE pancake-shaped iron meteorite Arlington was recovered and one planar surface was described as curiously pitted and rough [1]. We have earlier reported the presence of excess implanted light noble gases in the rough posterior surface material where the cosmic ray records indicate very small ablation losses [2]. We report the depth dependent noble gas isotopic abundances in four ~20 mm columns along a cut across the central part of the meteorite, using isotopic dilution methods. We also determined a $^{81}$Kr-$^{83}$Kr age of ~150 Ma by the new resonance ionization technique. Calculations of stopped solar particle radiation and GCR- and SCR-produced nuclides in 150 Ma in 2 Π-geometry are only consistent with observed concentrations below 2.5 mm depth and SCR effects are small over the entire depth range. Data from the topmost 2 mm reveal excesses of $^4$He, $^{20}$Ne, $^{22}$Ne, and $^{36}$Ar. These excesses are close to observed solar isotopic abundances, but indicate a redistribution of surface implanted solar particle radiation, as expected if erosion and cratering processes did plate ejected matter to crater rims, covering pre-exposed surfaces.

The GCR-spallation concentrations of $^3$He, $^{21}$Ne and $^{38}$Ar show a smooth depth dependence and permit extrapolations to the disturbed surface layers which show varying losses of these nuclides. The excess solar component when adjusted for such losses yield ratios $^4$He/$^{20}$Ne = 538 ± 20 and $^{20}$Ne/$^{38}$Ar = 36 ± 2 which are close to ratios observed in foils of the Genesis mission ($^{20}$Ne/$^{36}$Ar = 42 [3]). Observed constant spallation ratios $^{22}$Ne/$^{21}$Ne = 1.057 ± 0.011 and $^{20}$Ne/$^{21}$Ne = 0.946 ± 0.010 permit the subtraction of spallation gases in the surface layer and permit the calculation of an excess solar ratio $^{20}$Ne/$^{22}$Ne = 12.0 ± 0.1. This ratio is lower than values observed in Genesis foils and indicates either diffusion fractionation in the disturbed surface or fractionation in the implantation process when surfaces are affected by space erosion.

A test of space erosion was carried out by [4] who bombarded an iron meteorite and steel with projectiles of steel and sapphire and determined an erosion rate of 22 μm Ma$^{-1}$. These workers also found that the eroded volume of iron is 5 to 7 times larger than the measured mass lost from the target and that most ejecta were plated around craters. With an adopted erosion rate of 22 μm Ma$^{-1}$ we calculate an eroded layer of ~3 mm in 150 Ma, rather similar to the observed ~2 mm “disturbed” layers in our samples. Some circular pits observed in the posterior surface may therefore represent impact craters. Although the posterior surface of Arlington suffered corrosion in the terrestrial environment and minor ablation losses during its passage through the atmosphere, a useful record of ancient SW signatures has been preserved and its depth-profiles can be further studied by high-resolution techniques.