INCORPORATION OF ^{10}Be INTO EARLY SOLAR SYSTEM MATERIALS: A NEW MODEL. G. E. Bricker[1] and M.W. Caffee[1]. [1]Prime Lab, Dept. of Physics, Purdue University, West Lafayette, Indiana 47907, USA.

Introduction: Measurements of the decay products of now extinct radionuclides indicate that CAIs likely contained ^{10}Be at the time of their formation [1]. Since ^{10}Be is not formed nucleosynthetically [2], the presence of live ^{10}Be in CAIs at the time of formation seemingly requires the exposure of these materials to energetic particles. There is yet another mechanism for incorporating ^{10}Be in early solar system materials. It is known that ^{10}Be is currently produced in the atmosphere of the sun through the spallation of oxygen with energetic protons. This spallogenic ^{10}Be in entrained with the solar wind and implanted in solar system materials exposed to the solar wind. Nishiizumi & Caffee [3] detected solar-wind-implanted ^{10}Be in Apollo 17 trench samples. They calculated the current escape rate of ^{10}Be at the surface of the Sun to be $0.13 \pm .05$ ^{10}Be cm^{-2}s^{-1}. We propose that the ^{10}Be incorporated into CAIs was created in the proto-solar atmosphere rather than in-situ in the CAIs (cf. Lee et al. [4], Gounelle et al. [5]) by the same mechanism that we observe now, bombardment of O by solar energetic protons and He nuclei. This ^{10}Be escapes the solar atmosphere entrained in the solar wind. Some fraction of this outward flowing ^{10}Be is incorporated into the inward flowing material from the proto-planetary accretion disk falling into the Sun. In the region in which the inflowing material and outflowing solar wind intersect ^{10}Be is incorporated into the precursor CAI material.

Results: Using model parameters for mass inflow rate and ancient ^{10}Be production at the sun's surface scaled to x-ray luminosity seen in T-Tauri stars [6] we obtain a ^{10}Be implantation rate into infalling material; for our model we predict the concentration of ^{10}Be to be 1.2×10^{12} g^{-1}. McKeegan et al. [1]) report a ratio of ^{10}Be/^{9}Be=9.5×10^{-4} in CAIs from Allende. Assuming a concentration of 100 ppb for ^{9}Be as an order of magnitude estimate, the corresponding ^{10}Be concentration in CAIs is 5.5×10^{12} g^{-1}. Based on these calculations we conclude that this model may be a viable mechanism that can account for the ^{10}Be in CAIs.

References: [1] McKeegan, K.D. et al. 2000, Science, 289, 1334. [2] Marhas, K.K. & Goswami, J.N. 2004, New Astron. Rev., 48, 139. [3] Nishiizumi, K. & Caffee, M.W. 2001, Science, 294, 352. [4] Lee, T. et al.1998, ApJ, 506, 8. [5] Gounelle, M. et al. 2006, ApJ, 640, 1163. [6] Feigelson, E.D. et al. 2002, ApJ, 572, 335