REVISING THE K DECAY CONSTANT.

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The accuracy of current K-Ar age calculations is limited by the uncertainties of the ^{40}K decay constants [1,2]. Critical values to calculate K-Ar or Ar-Ar ages are: 1) the total decay constant of ^{40}K ($5.543 \cdot 10^{-10}$ a^{-1}, evaluated by data compilation of [3]) 2) the $^{40}K/K$ ratio of 0.01167% [4] and 3) the branching ratio of 10.48/89.52 of the dual decay to ^{40}Ar and ^{40}Ca [1,3]. These values can be revised by precise determination of systematic offsets of Ar-Ar and U/Pb ages of minerals from a variety of rocks of different geological age [e.g. 5,6], particular very old rocks like meteorites are useful [7]. However, many meteorite classes are seriously disturbed by secondary ^{40}Ar loss (HEDs, L chondrites, e.g. [8-10]), and only few retained ^{40}Ar since primordial cooling, e.g. certain R and H chondrites [7,11]. Using the H chondrite parent body cooling history [7,12], the age offset of U/Pb and Ar-Ar ages for c. 4.5 Ga old rocks is c. 30 Ma [7,13], significantly smaller than 1% as noted in [5] or [6]. A biotite from the Great Dyke Intrusion in Zimbabwe (c. 2.5 Ga old) yields an age offset of c. 20 Ma, while Ar-Ar ages of pseudotachylites from the c. 2.0 Ga old Vredefort impact structure [14] yield a difference of c. 17 Ma (recalculated for a new NL25 standard age of 2557±4 Ma). These new data lead to a decay constant of c. $5.520 \cdot 10^{-10}$ a^{-1}, only a little smaller than that defined by [1] - this result will not change including data from other laboratories [e.g. 5,6]. It is slightly different from a result obtained by direct detection ($5.554 \cdot 10^{-10}$ a^{-1} [15,16]), but different $^{40}K/K$ and branching ratios were used for these calculations. Geochronological data alone do not give clear evidence whether the branching ratio or the $^{40}K/K$ ratio is wrong by about 1%. If the $^{40}K/K$ ratio of 0.01167% is taken as correct, the decay constant to ^{40}Ar would be c. $0.575 \cdot 10^{-10}$ a^{-1}, corresponding to a branching ratio of c. 10.42/89.58.

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