Are we done with scaling methods yet?

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Abstract

After some experimentation with a number of production rate scaling methods in the early 2000's, in recent years the field of exposure-dating has settled on two scaling methods: a simple, non-time-dependent one developed by Devendra Lal, modified by John Stone, and known by the abbreviation 'St'; and a more complex, time-dependent, nuclide-specific one developed by Nat Lifton from modeling work by Tatsuhito Sato and known as 'LSDn'. Both fit calibration data fairly well and yield similar results for common exposure-dating applications. However, they are different, and their apparent equivalency is largely an artifact of the fact that calibration sites and sites of exposure-dating interest are mostly located in similar places and have similar ages. Thus, the questions in this talk are (i) how to determine which one is better, (ii) when we care which one is better, and (iii) what we should be doing to understand this better. To address these questions, I will discuss relatively new calibration data from very old surfaces in Antarctica where cosmogenic radionuclide concentrations have reached production/decay steady state and which can be used to distinguish St and LSDn scaling. I will then discuss some applications in analysis of large exposure-age data sets using the ICE-D database in which different scaling methods and calibration strategies lead to different conclusions. Finally, I will suggest some ideas for what kind of calibration data we should be collecting to do a better job of scaling method evaluation.

Keywords: Production rate scaling, production rate calibration

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