

Interactive comment on “Reviews and syntheses: Weathering of silicate minerals in soils and watersheds: Parameterization of the weathering kinetics module in the PROFILE and ForSAFE models” by Harald Ulrik Sverdrup et al.

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Received and published: 1 June 2019

Comment to Reviewer #1.

This article records some of the evolvement of the PROFILE model and the comparable part in ForSAFE, for the last 32 years since its conception in 1987. Since the Langan group did their assessment 20 years ago, much work has been done to change the model. Johan Holmquist works with this in his PhD thesis, for both forest soils (Asa Research Park) and for agricultural soils (Öyebyn Experimental Farm, SLU Experimental

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sites at Lanna, Uppsala). Cecilia Akselsson worked on this for her PhD thesis, when taking on how to parameterize both soil mineral surfaces and soil mineral wetting. Both represented significant challenges in terms of how measurement in a point in the landscape is transformed to a value representing a land unit or a landscape. It was not the scope of the article to describe this parameterization process, it has been described in these PhD theses and in subsequent articles in detail. An empirical relationship between different field estimations and a careful estimation of BET surface (Which in itself required a careful preparation) the estimation of the geometric surface area. This was initially developed for Sweden, the target of our first weathering map. Later this was developed for Switzerland (Reports by D. Kurz for the Swiss Ministry of Environment), by the de Vries research group for (Alterra), Netherlands and Maryland in the United States (Grey reports for Maryland Department of Natural Resources, a scientific publication in 1994 by Sverdrup et al.). This was treated in a dedicated section in the Mapping Manual for Critical Loads by Sverdrup, de Vries and Henriksen, issued by the Nordic Council in 1990. Further, under controlled conditions, the adequacy of using the BET measure under laboratory conditions on pure minerals was shown by Anna Nyström-Claesson at the Nuclear Physics Department in Chalmers University, Göteborg. The weathering rate was estimated with great accuracy under very well controlled conditions. The Langan group tried to develop for Great Britain something similar to the translation of Swedish soil classification translation to soil mineral surfaces. They showed that the Swedish empirical relationship would not give adequate surface area estimates for some British soils, which is not surprising. But, this issue is external to the simulation model. I do remember that the Langan group found some errors in the kinetics 20 years ago. It was update then, a long time ago.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-38, 2019.

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