

Introduction:

The text is rather heavy reading because of the complexity of the sentences, non-the less it is intelligent and proves deep insight, but needs some extra effort on the pedagogical side. The English language is flawless and reads well, but gets a bit complex, which I am sure can be abated.

For helping the non-expert reader I suggest you make a couple of simple conceptual drawings of your systems at the different scales (catchment, the hill-slope from Krycklan or micro site etc.) where you visualize with some examples, arrows or small 'ratios' the terms: 'runoff', 'water transit time', 'proxies for WTT', 'discharge', 'base cation release, -flow and flux', 'dissolution of minerals', 'weathering rates', 'chemical weathering', 'biological uptake', 'solutes', 'pore water', 'soil water', 'mineral surfaces', 'steady state', 'non-interacting', 'pathway', 'water parcel', 'stream concentration', 'mineral dissolution rate', 'concentration – discharge relationship', 'chemostatic behaviour', 'secondary mineral formation', 'rooting zone', 'unsaturated soil', 'saturated zone', 'vertical flow', 'water table', 'the silica effect', 'ratios of different important base cations Ca, Mg, Na, K'; a more clear overview of these terms would ease the 'putting into context' of this magnificent modelling work.

Once this is done the text needs probably a bit of refinement to simplify the many terms and split some complex sentences but this will become clear while working on that diagram.

Please clarify: The 'Glacial till soils' partly gets get separate introduction and soil is also generalized as unsaturated and saturated soils, could you rephrase or simply explain why this type has this focus and if it is included as saturated and unsaturated ?

The minerals: albite, bytownite, could you explain what these are with a little detail?

Site description: is the coniferous forest a managed forest ? if so, what age is the forest ? has it been disturbed with harvesting within recent years ? Is the soil saturated / unsaturated or variable ?

Discussion:

In order to get a better overview of the improvements with PROFILE, could you make a Table with the improved features, if these are new additions and the outcome (effect). You might need to fish out information from the connecting paper Sverdrup et al 2019 for the OH brake.

You need to update the reference to Sverdrup et al 'this issue' 2019; both in the text and in the reference list. Also you will need to provide the mentioned equations as supplementary material to this paper in SOIL, if it is not already published or has another current publication history. This will take some revision time, but should be allowed.