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Interactive comment on "Aluminium and base cation chemistry in dynamic acidification models – need for a reappraisal?" *by* Jon Petter Gustafsson et al.

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First we would like to thank referee no. 2 for his or her interest in our manuscript and for constructive suggestions as outlined in the major remark. However, no changes were made to the manuscript. The reason is detailed below the referee comment, as follows:

REFEREE NO 2: This paper clearly fits within the scope of SOIL. However, it is a pity that it only includes hypothetical scenario analysis illustrating the differences between the two concepts (ion exchange' versus 'organic complexation' models). Overall, the paper is a rather technical description various types of modelling approaches. This

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makes the paper less relevant for a broader audience. More important, however, a comparison with observations (such as pH, Al concentration and base saturation) is missing. Such a comparison is absolutely needed to judge the performance of both concepts. I realize that this is not an easy task, but a validation/application of the presented modelling concept by using e.g. the Gårdsjön observations or observations from Wesselink and Mulder (1995) and/or Bonten et al. (2001) must be doable. I therefore conclude that, although the current manuscript addresses a relevant issue and is well written, a major revision is required because a comparison with observations is missing.

ANSWER: The purpose of the paper was “to review the process descriptions of currently used models as regards base cations and aluminium, and then to investigate the difference in model performance between the two types of model mentioned above, i.e. between ion-exchange models and organic complexation models”. To this end, the paper was able to evaluate the response of the different exchange/complexation models to abrupt changes in chemistry. Because of this, the paper was also able to draw conclusions about the implications of choosing one exchange/complexation model over another, as well as the implications for the back-calculation of historical exchangeable pools (which remains uncertain in many of the current ecosystem biogeochemical models mentioned in the paper). The paper did not set out to “validate” biogeochemical models themselves, but it serves as a basis for future work devoted to the overall behaviour of biogeochemical models and how these are influenced by the choice of the investigated exchange/complexation models. For that eventual step, an evaluation of model performance compared to observations would certainly be relevant.

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