

Review of MS EGU<sub>sphere</sub>-2024-2371:

## **“Estimation of critical loads and exceedances of acidity and nutrient nitrogen for mineral soils in Canada for 2014-2016 average annual sulphur and nitrogen atmospheric deposition”**

by H. Cathcart et al.

submitted for publication in *EGU<sub>sphere</sub>*.

### General remarks:

An interesting paper describing the computation of critical loads of S and N for the whole of Canada, which is done here for the first time (earlier studies dealt with subregions only). The paper is well written, with some (minor) issues to be clarified, specially about Cl-deposition (see below). Thus, I suggest that the paper should be published with **minor revisions**. The corrections/amendments listed below should be addressed before re-submission.

### Detailed remarks:

**Note:** ‘X’ → ‘Y’ means: replace ‘X’ by ‘Y’ (in the text).

### **Abstract:**

L[in]e 20: “Soil critical loads of nutrient nitrogen ... model.”: That’s already said in the first sentence!

### **1 Introduction:**

L28: “... and acidic deposition ...”: a bit superfluous, since it is S and N deposition that forms acidic deposition ... Drop or reformulate!

L46: Delete ‘acidic’ – this also holds for nutrient N CLs.

L57: Insert ‘soil chemistry’ after ‘steady-state’.

L61: ‘disharmony’: isn’t there a better word? (incompatibility?)

L72: ‘effect’ → ‘effects’.

L73: ‘estimated’ → ‘assessed’.

L75: Insert ‘(i.e. S+N)’ after ‘acidic’ (?).

L78: ‘criterion’ → ‘criteria’.

### **2 Methods:**

L113: Delete ‘and defined as’.

L116: ‘BC<sub>dep</sub>’: In the text all mathematical variables are in upright font, whereas in the equations they are in italics! I suggest to make it in italics everywhere (?)

L138: The parentheses could be left away ... [also in some other equations]

L152: What is ‘WGS84’?

Table 1: (a) Reference(s) for ‘Biomass’ is/are missing; (b) Remove parentheses around ‘CEC, 2018’; same for ‘Galmarini ...’ and ‘Moran ...’.

L161: What does ‘Generalised’ mean in this context?

L171: What do you mean by ‘× 5g kg<sup>-1</sup>’? Clarify!

L182: ‘Bc<sub>dep</sub>’: In eq.1 it’s BC<sub>dep</sub>! But since you are never mentioning again Cl<sub>dep</sub> (from eq.1), I presume that you have assumed that Na<sub>dep</sub> = Cl<sub>dep</sub>, and thus BC<sub>dep</sub> – Cl<sub>dep</sub> in eq.1 becomes Bc<sub>dep</sub>! **This has to be corrected/explained!**

L250: Delete ‘scenarios’.

Table 2: Insert ‘(mol/mol)’ after ‘Bc/Alcrit’ in header.

L263: ‘... all other regions were set to 0’ → ‘... in all other regions it was set to 0’.

L278: ‘against’ → ‘using’.

L290: Explain ‘CPCAD’.

### **3 Results:**

L309: 'estimate' → 'estimated'.  
L326: 'under 5% and 20% growth reduction scenarios' → 'for 5% and 20% growth reductions'.  
L329: 'coverage' → 'averages' (?) [otherwise, what do you mean?]  
L335: BC<sub>dep</sub>: Why suddenly upper-case 'C'?  
L338: 'loss of definition': What do you mean? [is this a technical term well known?]  
L338: The value after smoothing (68) is higher than the pre-smoothing value (52)?  
L372: Delete '(Figure 12B)' – it shows nothing about acidity CLs.  
L386/7: A bit strange text; maybe write 'Modelled annual average (2014-2016) total deposition of sulphur (S<sub>dep</sub>, panel A) and nitrogen (N<sub>dep</sub>, panel B). Maps were ...'  
L389: Insert 'average' before '2014-2016'. (?)  
L394: '... result of higher CL...' → '...result of lower CL...'. !!  
L403: 'plus' → 'and'. (also L409)  
L407: 'including' → 'using'.  
L425: 'reducing' → 'increasing'! [adding Bcdep allows more N-uptake, leading to higher CLs, and thus lower/less exceedances (5% instead of 9%)]

#### **4 Discussion:**

L438: 'of' → 'in' (?)  
L454: 'Mcnulty' → 'McNulty'.  
L458: Delete 'map', twice. (?)  
L472: '7.26 ×' → '7.26 times'.  
L502: 'region' → 'ecosystems'.  
L522: 'Pine' → 'pine'.  
L524: 'ha-1' → 'ha<sup>-1</sup>'; also for 'yr-1')

#### **5 Conclusions:**

L540: Delete 'to several parameters'.  
L545: insert 'average' after 2014-2016.  
L553: 'they provide' → 'as providing'.

#### **References:**

General: The references are not given in a consistent style: In some the title of the paper/report is with upper-case first letters, in some not. In some the DOI is given, in others not. In some, especially for reports and book chapters, the place and/or publisher is missing.

Specific:

L674: 'Mcnulty' → 'McNulty'.  
L700/1: Is this an article? In which Journal? Or a report?  
L707: Spell out "Nord. Counc Minist Cph,Den."  
L763: 'AL' → 'Al'.  
L773: 'de Vries' → 'De Vries'; and move up to the other 'De Vries ...'!  
L775: Why "McDONALD"?

Note: These are only those 'flaws' seen when glancing thru the Refs. I guess that there might be more ... In any case: Please check and harmonise the References.