

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-268

Olivier Pourret (Referee)

Referee comment on "Dynamics of rare earth elements and associated major and trace elements during Douglas-fir (*Pseudotsuga menziesii*) and European beech (*Fagus sylvatica* L.) litter degradation" by Alessandro Montemagno et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-268-RC1>, 2021

Comments by Olivier Pourret (06/12/2021)

This study by Montemagno et al. deals with rare earth elements dynamic during litter degradation. This study is of high quality and well conducted and should be published after some minor revisions.

I would like to basically agree with authors' arguments but some parts need to be strengthened:

- Analytical section (sample analysis) is very short, details should be added especially regarding QA/QC; isobaric interferences may occur, it must be checked and clearly stated.

- In the discussion section, it would be useful to check how microorganisms, siderophores,... may have a role on redox behavior of Ce. It is stated in the M&M section that biotic communities were preserved.

- In the same part, authors consider Mn oxides, what about Fe oxides?

- In the discussion section, the part dealing with Eu anomaly need to consider all the relevant literature on the subject, check my latest article <https://doi.org/10.1007/s11104-021-05210-6> where we wrote that such Eu anomalies may be caused by precipitation of Eu-enriched phosphate particles in plant organs; may be linked to the strong depletion of Ca in the soils where plants may suffer from Ca-deficiency. Eu can be absorbed and bound to the inner membranes of plant cell

organelles. Even if the transport proteins that can mediate REE uptake by plant cells have not been fully characterized and REE may inhibit cation channels, most studies to date have demonstrated that ion channels, especially Ca^{2+} , K^+ and Na^+ channels, mediate REE uptake by plant root cells which also explains the preferential accumulation of light REEs in plants due to their similar ionic radii and the physiochemical properties of LREEs and Ca^{2+} . Moreover, Eu may be transported apoplastically across the root to the xylem like Ca. Additionally, there is evidence that during root–shoot translocation heavy REEs are preferably transported to the shoots which has been attributed to the higher stability of heavy REE complexes formed with organic substances, especially amino and organic acids in the xylem. Overall, this suggests that most plants discriminate between cations differing by their ionic radius and charge during uptake and transport within plant tissues. The effects of these processes can be usually observed in fractionation pattern of concentrations of LREEs relative to HREEs depending on plant species, growing conditions and plant tissue. Calcium and Eu have almost identical ionic radii, which means that Eu is likely to competitively replace Ca ions in biological systems. Although, a biological role for lanthanides is not known, previous studies have shown that Eu can substitute for Ca in plants and/or replace Ca in cation binding sites due to similar ionic radii, in particular in soils with elevated Eu/Ca ratios. Did you check this ratio?

Minor comments

In the title, replace Rare Earths by rare earth elements.

L661 at the beginning of a sentence fully write the name of an element.

Check if police, size fonts and color of figures are accessible.

Carefully check the reference list, there are many typos (Capitalized words, mistakes in the issue number...).

