

Journal: BG

Title: Biogeochemistry of an Amazonian podzol-ferralsol soil system with white kaolin.

Author(s): Y. LUCAS et al.

MS No.: bg-2011-493

MS Type: Research Article

#### General comments

The authors present an impressive dataset for groundwater samples collected along a podzol-ferralsol catena overlying a kaolin depot in Amazonia. They were able to distinguish two flow pathways with characteristic water chemistries with regard to Al, Si, Fe and DOC mobility and transport, and infer new insights in the genesis of these soil systems.

The authors demonstrate great knowledge of this soil system. Despite the fact that this manuscript represents only an excerpt of a comprehensive dataset on this soil system - publications that include more in-depth characterizations of the mineralogy and DOC chemistry appear to be in prep - the manuscript presented here has significant shortcomings that need to be addressed before I can recommend publication.

In the following, I will use the abstract as an example to briefly illustrate my main concerns:

While the authors state that podzol-ferralsol systems are widespread in Amazonia and are frequently associated with kaolin deposits, there is no mention of the general research problem addressed in this manuscript. The authors then go on to describe the wealth of their results without stating a specific research question or hypothesis. Finally, the manuscript ends in a statement of possible implications that will confuse even the informed reader.

This is symptomatic for the whole paper and I advise the authors to make a serious attempt to revise the presentation of the abstract, introduction, discussion and conclusion sections. It is not clear to me what is unknown, what the specific research questions are, and why the relevant in the context of global change and C cycling.

Moreover, I suggest trying to disentangle the main angles the authors provided in this manuscript: (i) the dynamics of DOC in these soil systems, their sensitivity to global change, and the implications for global C cycling; and (ii) the relationship between soil processes, kaolin deposits, and landscape forms, and what this all means for kaolin ore exploitation. How are they related/not related? What specific aspect can be resolved with this study?

Finally, I recommend that the authors incorporate findings from the other publications on mineralogy and DOC chemistry. These are critical factors that need

to be taken into consideration if one is to develop a thorough understanding of the pedogenic processes at work in this soil system. Without these data, any inferences appear a little premature.

#### Specific comments

##### Abstract:

L12: change to “ ... in THE acid podzolic ...”

It would be beneficial to the reader if the last sentence of the abstract was reworded. I suggest “ ... kaolin are likely to occur where active giant podzols are close to a slope gradient sufficient to ...”

##### Results:

P2244L16-19: Why is it necessary to report this data in the main manuscript? I suggest moving this information in the supporting materials.

P2248L13: Please revise the wording – the following is confusing: “There is no, however, a good correlation ...”. I understand that there is no correlation and that is what should be said.

Fig. 7: I find it counter-intuitive that the sampling points are plotted in this sequence. In Fig. 2 it looks like water flow along this pathway reaches the sampling points in the following order: P4-240 – P13-160 – PMVB – P12-160.

In any case, connecting the data points with a line is misleading as it suggest to the reader that water flows along this sequence.

##### Discussion:

P2251L7: What exactly is the positive feedback? Please expand.

P2251L: Equation 1 - Define the terms of the equation. COD?

L22: change ‘was’ to ‘whereas’

P2252L4: Your aim is not to ‘give an order of magnitude’. What the authors are trying to do here is to approximate the acid-site densities of DOC using a single carboxylic-acid type ligand as a model. Please rephrase.

P2256L1517: How do reconcile your hypothesis that DOC becomes mineralized (or ‘turned over’) after adsorbing to mineral? Most publications indicate that adsorption to clays and Fe oxides protects DOC from microbial decomposition.