Anonymous Referee #3- *Received and published: 13 July 2013*

The present state the paper lacks of organization (amount of sentences in discussion should be moved to results even introduction.

Some sentences in discussion were moved to results even introduction.

1. Introduction:

Please add a paragraph to state the preservation of the original REE and Nd message. How is dust trapped? how can you rule out any exchange with water? How can you rule out differntial preservation (differential affinity with some mineral surfaces or organic compounds).
Modified

Page 2892, last line: you seem to only consider long distance dust transport... what's about short distance dust transport?

The Local and regional sources from *short distance* also influence the dust deposition, that is why we investigated also changes in vegetation cover using pollen literature data.

Page 2893, line 8 to 12: go behind the references and clearly tell readers what were major conclusions and how authors came to these.
Ok, it is modified.

2. Material and methods
2.1. Sampling and preparation
p. 2894, Line 6: how do you deal for Ti measurement ?
The Ti and the others elements were digested by complete digestion with a mixture of HNO_3-HF-H_20_2 in Savillex® beakers on a hot plate in a clean room (class 100). The digestion of organic matter was improved by an addition of H_2O_2 in the reaction chamber (Krachler et al., 2002).

p.2894, line 14: what is at the origin of the hydrologic changes?
surely paludification.

2.3 Chemical analyses P. 2894, line 25: discontinuous sampling of the paleoenvironmental signal... highly risky!!
We agree with the reviewer, however we analysed the density at one centimetre resolution

P. 2894, line 25: : how many grams? Even approximatively? or at least what the sediment volume used for REE?
We have taken about 100 mg to measure the concentration of REE and the others elements (Ti, Zr, Al)

p. 2895, line 4: how do you deal with matrix influence? your standards are vegetal thus quite different from mineral samples.
The NIMT Peat standard was also measured. The text has been modified

2.4. Testate amoebae please provide some ecological and physiological treats!
All ecological and physiological treats were described in Beghin et al., preparation "*Surface wetness reconstruction using testate amoebae analysis of the mid to late Holocene Misten peat bog (Hautes-Fagnes, eastern Belgium)".*

p. 2896, L.11: did you count testate on every 1cm-slice sample? or only 6 slices of 20cm as evidenced by table 3?
The count testate has been done every 3 cm, but the zonation in the table 3 was established according to the testate amoebae distribution.

2.5. Radiocarbon dating

P. 2896, L. 19: are they all from high superior plants (see Hatté and Jull) did you rule out any "peat decomposition effect" on 14C ages? why/how?

Kilian et al. (1995) noted that, in their study, samples of raised bog peat containing fine Calluna vulgaris rootlets yielded ages that were 100–150 years too old. They attributed this to a "reservoir effect", perhaps due to re-use of 'old' carbon, notably methane, which might be fixed by mycorrhizal fungi in the Ericaceae rooting zone or merely used by fungi and incorporated into bulk peat samples. CO2 emitted from decomposing layers of the bog can also become incorporated, with similar effect. A detailed study by Jungner et al. (1995) on two ombrotrophic sites in Finland indicated that the effect was irrelevant to the apparent age of the peat because the CO2 was released from shallow depths of almost the same age as the dated samples, and amounted to around 20% of the CO2 uptake by Sphagnum. Therefore, the effect was significant only for the period of maximum-intensity nuclear weapons tests. Similarly, Blaauw et al. (2004) did not find significant 14C age differences between bulk peat (often containing heather rootlets) and pure Sphagnum samples; and the results of radiometric dating of bulk ombrotrophic bog peat samples from southern Poland did not show any age alteration, and a well-constrained chronology was constructed and reported by Fialkiewicz-Koziel (2009). Nonetheless, it is recommended that the use of bulk samples of raised bog peat containing large amounts of Calluna rootlets should be avoided.

3. Results

3.1. Density, ash content and humification

P. 2987, L. 4: N is missing here

Corrected

p. 2987, L. 8: how can you get a negative value for R? both are increasing.

It is changed and corrected in the revised ms.

3.2 Elemental concentrations

p. 2897, L. 18: would you have a problem with sample numbering for Lu that would explain the shift at 450cm? is it an artefact?

No, because we have measured 4 samples from 444 to 453 cm and Lu concentration varies between 0.002 and 0.003 µg/g

p. 2897, L.21: authors might want to provide R value.

Ok, this is done now

3.3. Dust flux please provide some explanation of the very high discrepancy between all derived flux. It is higher than expected.

The difference in dust flux values depends on the reference element used (e.g. Ti, Al, Zr) to calculate it and to their concentrations measured in the samples and their relative amounts in the Upper continental crust.

3.4. Chronology of peat accumulation

P. 2898, L. 22: resolution is even less as you analyzed each four samples Such a way, you can miss some peaks or reversely, evidence some peaks that don't really exist.

We analysed the ash content with a high resolution (every cm).

4. Discussion

4.1. REE distribution pattern beginning: that's not discussion but results

4.2. Dust sources

p. 2900, line 5: I'm not a specialist of REE but it appears strange to me to imagine "immobile REE" anywhere. there is water in peat, low pH and high redox strengh and complexing OM...

First: Scandium and Zr are conservative (very insoluble) elements widely dispersed in crustal rocks. Scandium has been found to behave as conservatively as Zr, Ti in the studied peat profiles. So, the possibility of REE mobility can be most probably excluded because the profiles of REE were similar to all preservative elements as Zr, Sc, Ti.
Second: Correlation coefficients indicate individual REE vary in the same manner within the deposit with r values >0.95. The high correlation between individual REE, especially Ce, which is redox sensitive at low temperatures (McLennan, 1989), suggests these elements are immobile.

p. 2900, line 19: volcanic? I'm not convinced at all. If volcanic is one of the mixture poles, what is the second one? You definitively face a shift, even towards less Yb depleted values or towards more La enriched value. Two explanations might be: your potential sources are not the good ones or your assumption of REE immobility in peat is false. where do Gallet's loess come from? what's about Belgian fluviatile sediment? what's about North Sea Nd?
The second pole is the European and Belgian loess and Sahara.
The Gallet' loess comes from Western Europe (The Netherlands, Belgium, France, UK) contain marin samples (where $-11<\varepsilon Nd<-8$).
All REE and Nd isotopes values reported from Linnemann et al. (Science Reviews 112 (2012) 126–154) are measured in Brabant Massif from Southern Belgium. These sediments of Brabant Massif are mainly slate, sandstone, quartzite and greywackes. The Brabant Massif are beneath the North Sea in the NW. Along its southeastern rim, incising rivers. Then, the values taken from Brabant Massif content the Belgian fluviatile and North Sea sediment values.

P. 2900, line 21: according to table 1, it is rather 4880 or 4900 BC
Corrected and all dating were changed to BP

p. 2900, line 25: such a notation does not suit to calibrated radiocarbon age. probability distribution around mean age is far from being Gaussian. calibrated ages should be presented as interval. [4757 BC - 4877 BC] & [4829 BC - 4979 BC], [3041 BC - 3316 BC]
Corrected and all dating were changed to BP

4.3. Evolution of dust deposition during Mid and Late Holocene
P. 2901, line 11: high sensitivity: by now, you still don"t show any proof of that. you only showed that dust sources might have been diffferent in the past.
Yes but this an introduction from the literature to explain the change in our data.

p. 2901, line 12: "check" would better suit here rather than test
Changed

p. 2901, line 21: TA, first occurence of this abbreviation. Not useful at all: keep testate amoebae.
OK, modified

p.2901, line 23: you're here in the discussion section. This kind of considerations should not be here but much earlier in the introduction... and should also be greatly developed.
OK, this part is moved to the introduction section and developed.

p. 2902: could you provide a synthetic figure that gathers all important parameters: dust flux (only one), humification, Nd together with the temporal zones and some major literature data you use here. It would be much easier for reader to follow your mind instead of having to look at 3 different figures and in 5 papers.
OK, modified (Figure 9)

p. 2902, lines 11-12 & lines 18-19: this sentence should be combined with the previous one dealing with dust sources. In this part you intend do discuss climatic information provided by dust: climatic results should thus be the last point of each §.

OK, modified and moved

P.2903: what does explain the timing lag between all records?
We thing that the timing lag between the records is mainly due to uncertainties in the age depth model in all records.

4.4 comparison of dust deposition records from pet bogs and ice cores
Page 2904, line 13: what's about loess? please restrict your affirmatiion to interglacial only. Furthermore this doesn't find its place in the discussion section and should be moved to introduction.
Ok , changed

page 2904, lines 19 and following: provide a figure that gather all records. It would be much easier for readers to follow your comparison and you won't have to do a boring description of Canadian results.
OK, modified

page 2905, lines 1 and following: much too long. Your paper is on Belgian peat bog. a figure that gathers all records is definitively required.
OK, modified

page 2905, line 27-30: I'm so sorry but I don't find this demonstration in the paper. Where did you show that Saharan dust played an essential role in dust loading over Europe?
Recently Nd isotope data from the same Suiss bog confirmed the importance of Sahara as a dust source over West Europe (Le Roux et al., 2012). A sharp Saharan-dust event at 8.4 kyr may suggest a role of atmospheric dust in the 8.2 kyr BP cold event. In this study We found that the maximum dust flux correspond to cold events. The dust deposition and Nd isotopes showed the importance of Sahara as a dust over Europe both on a long term basis but also during abrupt events.

Figures & Table
Table 1: age can not be associated to negative value if result is provided in BC. it either negative in AD or positive in BC. Did "Bacon" provide this mean age? should be mentioned. what is this mean age? do you mean "most likely age" that does have a signification or the arithmetic average between min and max that does not have any signification ?
The table 1 was modified, the mean age is provided by Bacon.
Figure 5: add element from which you derived dust fluxes on the figure itself
Ok, modified

Figure 5: same remark for dates here too.
Ok, modified

Figure 7: legends are much too small to be readable! enlarge policy.
Modified

Figure 8: greatly enlarge the legend! what is the gray and black for? what are the red dotted line and red plain line for? please correct the calendar age (no negative value) and keep the same policy as for y axis
All is corrected