We would like to thank the reviewers, S. Wulf and R. Santacroce, for their constructive comments and suggestions. Following the reviewers suggestions, we propose several improvements to the manuscript. Here we will give a point by point reply to the comments of each reviewer.

Response to comments of Referee S. Wulf

1) Since this is a tephra paper, it would be appropriate to include a table in the text showing the average glass composition of individual Prespa tephras (normalized data including a 2 sigma standard deviation). Most of the Harker diagrams (figure 4, 6, 7 and 8) include only plots of alkalis versus silica oxides, which are not completely representative. Sodium values, for example, are very prone to a loss during measurements and strongly depend on the analytical setup of the instruments, both SEM-EDS and EPMA. It is therefore important to visualize the data as a whole in, for instance, an additional table. The supplementary table 4, in turn, shall provide the original, non-normalized data including oxide totals.

A table showing the average glass composition (normalized and including SD) of the Prespa tephras is now given in the main document (Table 4). In the Supplemental Online Material (SOM), we provide the entire composition data set (including oxide totals) (Table 5) and the data sets of the tephras used for correlation purposes (Table 6).

The non-normalized data cannot be provided, because the original EDS data is automatically normalized because of ZAF correction (see also, chapter 3 "Materials and methods, Page 4448-4449, line 29 and 1)

2) Please provide a more detailed description of tephras in chapter 4.2 including, for example, more concrete values for tephra thicknesses and maximum grain sizes of tephra components. If possible, please provide also information on the mineral assemblage and or lithic content. The information on the sediment depths of the cryptotephras indicates thicknesses up to 2 cm, which are unrealistic for "cryptotephras". Please provide more detailed depths or explain the large range of depth.

The thicknesses of tephras were determined though visible inspection and/or peaks in XRF and MS values and are now given in the text. The exact thicknesses of cryptotephras are unknown and can only be estimated by the number of sieved and microscopically analyzed 2 cm thick horizons, in which the tephra is dispersed or by the peak boundaries in MS (i.e. PT0915-1). A more detailed description is now included in chapter 4.2, and also the maximum grain sizes of tephra components are enclosed.

Information on the mineral assemblage and lithic content can unfortunately not be provided, because the respective analyses were not carried out.

3) Chronology discussion: You state in Chapter 2 that the catchment area of Lake Prespa is partly composed of carbonate rocks. Since these rocks may bring in "old" carbon into the lake, it is therefore necessary to discuss any possible hard water effect on the radiocarbon ages, particularly on those obtained on aquatic plants and bulk sediments. Please include this information either in chapter 3 "Material and methods" or in the discussion in chapter 6 "Core chronology and sedimentation rates".

The information about a possible hard water-effect is now included in the chapter 3 (Materials and methods).

4) I agree with most of the tephra correlations proposed in the manuscript. However, there arise two issues that need further clarification:

a) Cryptotephras PT0915-3 and PT0915-4: I totally agree that those tephras are related to pre-NYT activities of the Phlegrean Fields and that those eruptions are difficult to distinguish just on the basis of major element glass composition. I also agree with a correlation of those two tephras with the marine LN1-LN2 layers interpreted as the Tufi Biancastri deposits by Siani et al. (2004). However, the relationship with the Monticchio tephra record should be discussed in more detail. You have shown in figures 4 and 8 that the Prespa tephras do not match tephra TM-9 which was related to the Tufi Biancastri by Wulf et al. (2004). This might indicate a miscorrelation of either the Monticchio tephra or the marine tephras with proximal deposits, which needs to be discussed at this point. In addition, I recommend to also compare the Prespa data with major element glass data of tephras TM-10a to TM-10d (original individual data available upon request) that were correlated by Wulf et al. (2004) with the proximal Lagno Amendolare deposits. Here in particular, tephra TM-10c seems to match the composition of one of the Prespa tephras. I furthermore agree with a potential correlation of the Monticchio tephra deposited after TM-9 (labeled as "TM-9 upper" in the manuscript: PLEASE re-label as "TM-8-1 (Wulf, pers. comment, 2012)". Both tephras TM-8-1 and TM-10c show in addition similar ages as the marine LN1-LN2 tephras (14,460 and 15,500 calendar years BP). Please add this information in your discussion.

The correlation to the Monticchio archive is now discussed in more detail, and includes the TM-10 tephra and re-labeled TM-9 (upper) to TM-8-1.

b) Tephra PT0915-6: I don't think that such a detailed discussion about a possible correlation with unknown Vulcano tephras is necessary, since I think that tephra PT0915-6 can be clearly associated with the Codola eruption based on the following argument: Your individual glass data shows in most cases extremely high Al2O3 and CaO values that indicate a strong contamination of glass shards with plagioclase microcrysts. This effect has also been observed for Monticchio tephra TM-16a (30,240 calendar years BP, Wulf et al., 2006). The residual data is quite in agreement with the thick Monticchio tephra TM-16b (31,120 calendar years BP, Wulf et al., 2006) (individual glass data available upon request) and shall therefore relate to the Codola eruption. I therefore strongly recommend re-evaluating the Prespa glass data and simplify the discussion section.

We agree that Codola could be the potential counterpart of PT0915-6. Therefore we simplified the discussion section of PT0915-6 and linked this tephra with TM-16/Codola. However, there is insufficient information about Codola and PT0915-6 shows partly a different compositional trend than most Codola products, including TM-16 (Fig. 4). Codola tephra particles previously recognized in the Balkan region are porphyritic (microcrystals in the groundmass), while PT0915-6 is glassy and therefore excludes the idea of contamination. This makes an unambiguous correlation difficult. According to the sedimentation rates obtained by interpolation from the other chronological tie points above and below, the age of PT0915-6 is ~35 kyr. The proposed age of TM-16 is much younger and would result in a distinct shift in the sedimentation rate of Lake Prespa.

5) It is very interesting that Campanian tephras documented in Lake Prespa (and also Lake Ohrid) can be also found in Lago Grande di Monticchio, but that those from Pantelleria and Mount Etna are

recorded in either one of those archives. For example, the Y-1/Biancavilla tephra (17 ka) and Ante-Green Ignimbrite (89 ka) tephra is found in Monticchio but not in Prespa, while Y-6 (45 ka) and an unknown 60 kaEtnean tephra are only deposited in Prepa. This distribution pattern gives valuable information about a complex tephra dispersal resulting from interplay of different wind patterns, i.e. the Westerlies and the Scirocco winds from the South. This kind of information should be included in a different discussion chapter or in Chapter 7 "Conclusions".

The information about the dispersal and wind patterns has been included in chapter 7 (Conclusion).

Detailed comments:

Page 4443: Change the affiliation of Norbert Nowaczyk to "German Research Centre for Geosciences GFZ, Section 5.2 – Climate dynamics and landscape evolution, Telegrafenberg C321, 14473 Potsdam, Germany".

The affiliation of N. Nowaczyk has been changed.

Page 4444, line 1: Please be more detailed about the age of the basal sediments, i.e. MIS 5b (ca. 91 ka BP)

Done.

Page 4444, line 20: Please provide information about the provenance of cryptotephras PT0915-6 and PT0915-10, i.e. Campanian area.

PT0915-6 and PT0915-10 represent unclassified tephra. The possible origins have only been discussed in chapter 5 (Discussion and interpretation).

Page 4445, line 14: Change to "…is considered to be a promising region for distal tephrostratigraphic studies…"

Done.

Page 4445, line 16: Please give information on the distance of Italian volcanoes to Lake Prespa.

Done.

Page 4446, line 2: Please change and add "…to known eruptions, documented i.e. in proximal and distal deposits, can…", since you are comparing most of your data with the distal Monticchio record.

Done.

Page 4446, chapter 2 "Regional setting": Since you are mentioning IRDs in the sediments and ice cover in the Prespa area in chapter 6 (discussion), it is appropriate to include this information also in this chapter.

Done.

Page 4447, lines 5-7 and page 4448, line26: Please include information about the location of the XRF scanner and the SEM-EDS analyzer (University of Cologne?).

Done.

Page 4447, line 13: Please use a reference other than Nowaczyk et al. 2012 since this paper is still in preparation and therefore is not citable.

The reference is temporary removed, until N. Nowaczyk submits the paper.

Page 4448, line 21: What do you mean with "washing selected sediment sections"? Did you treat the samples with H2O2 or HCl? How large were the sample amounts? Please provide more detailed information.

We now provide this information in chapter 3 (Materials and Methods).

Page 4453, lines 18-19: Traces of the 12.1 ka Vedde Ash from Iceland were recently found in the Lake Bled sediments (Slovenia) proofing a further distribution than supposed (Lane et al., 2011, QSR Vol. 30, 1013-1018). This information needs to be included in the discussion section. You may also cite a newer paper showing the distribution of the LST in Europe (Riede et al., 2011, Quaternary International 246, 134-144). Also add a reference for Massif Central tephras.

We added the relevant information and references in the text.

Page 4454, lines 26-28: In order to distinguish between the 472 AD and 512 AD events higher sedimentation rates of host sediments would additionally be required. The sedimentation rates in Lake Prespa are much lower than in i.e. Monticchio and therefore may not provide two distinct layers but a mix of both events in one single horizon. You may add this statement in the discussion as a further argument.

This information is added.

Page 4455, lines 7-11: The Mercato tephra was also identified in the sediment cores of the Island of Mljet, where it shows a bimodal composition similar to the Monticchio TM-6a and TM-6b tephras (see Jahns and van den Bogaard, 1998, Vegetation History and Archaeobotany 7, 219-234). Please add this information.

This information is added.

Page 4456, line 11: The reference is Wulf (2001). Please change throughout the text and in the list of references.

We changed the references accordingly.

Page 4457, line 17: Please change reference to "Pappalardo.." instead of "Papparlado".

We changed the references accordingly.

Page 4458, line 5: The varve age of Y-3/TM-15 in Monticchio has been revised in Wulf et al. (2006) to 27,260 calendar years BP. Please use that new age.

We corrected the age of TM-15.

Page 4460, line 7: The varve age of TM-18 is 36,770 calendar years BP according to Wulf et al. (2006). Please correct.

We corrected the age of TM-18

Page 4460, lines 19-20: Tephra PT0915-8 has an almost identical composition as the Campanian Ignimbrite and tephra PT0915-7. How can you conclude that this tephra has a different origin from Ischia volcano? I suggest changing the source to "Phlegrean Fields" or more general to "Campanian area".

We proposed Ischia as the most probable source because PT0915-8:

a) **has the best compositional match with the SMP1-a eruption, which originated from Ischia Island (Di Vito et al., 2008)**
b) **has an alkali ratio around 1, which is typical for Ischia Island**
c) **shows affinity to Ischia Island according to the Na_2O+K_2O vs. K_2O/Na_2O diagram**

Page 4459, line 5: Monticchio tephra TM-18-1d is dated at 37,360 calendar years BP (Wulf et al., 2006). Please correct this age. Furthermore, TM-18-1d is directly underlying the Campanian Ignimbrite in the Monticchio record. According to your sedimentation rate chronology, Prespa tephra PT0915-8 is deposited at ca. 42-43 ka BP (please provide age at this point), close to the Y-6 tephra. How do you explain the high sedimentation rates between the CI and tephra PT0915-8 in your core? Can this be explain by a miscorrelation?

The age of TM-18-1d is corrected.

According to the Prespa age-model, PT0915-8 was deposited around 44 cal kyr BP (Fig. 10). This is within the age range proposed by Di Vito et al. (2008) for the SMP1-a eruption. Considering tephra TM-18-1d, which has been deposited only 590 years before the CI and was correlated to the SMP1-a, the correlation of PT0915-8 with SMP1-a eruption becomes indeed problematic. Applying the age of TM-18-1d for PT0915-8 would result in an extraordinary shift in the sedimentation rate, which is not supported by the lithology of the core. We discussed this issue now more in detail in chapter 5 (Discussion and interpretation/PT0915-8)

Page 4462, line 15: Please provide the interpolated age for tephra PT0915-10 based on the estimation of sedimentation rate. You may mention here that in this time frame there are numerous tephra layers in the Monticchio record with very similar composition as PT0915-10, and that a correlation without additional trace element data is not possible at this point (cite Wulf, pers. comment, 2012).

The interpolated age for cryptotephra PT0915-10 is now provided in chapter 6 (Core chronology and sedimentation rates).

Page 4463, line 2: Please provide ESR date again in parenthesis.

We provide the ESR age in parenthesis now.

Page 4464, line 25: Change "cold climate" to "cooler climate".

We changed the sentence accordingly.

Page 4465, line 20: Change "corresponds with" to "corresponds to".

We changed the sentence accordingly.

Page 4467, line 13: Delete “a” in “The study of a sediment core Co1215…”.

We changed the sentence accordingly.

References: Delete the reference “Macdonald (1974)” since it does not occur in the text. Replace the reference “Nowaczyk et al. 2012, in prep.) by a different reference.

Macdonald (1974) is cited in chapter 4.2 (Tephra and cryptotephra description/PT0915-9).

The reference “Nowaczyk et al. 2012, in prep.” is temporary removed, until N. Nowaczyk submits the paper.

Page 4478, line 29: delete the space character in “V ogel”. Page 4479, line 6: change the year of publication of Wulf from “2000” to “2001” and change throughout the text, figure and table captions.

We changed the text accordingly.

Figure 1: Please check the scale in figure 1a, since it seems to be too large.

We changed the scale accordingly.

Figure 4: These diagrams are way too small and hard to distinguish. Please provide also references for the correlative data, particularly for those not mentioned in the text. Please make also sure that you cite the detailed figure number in the text, i.e. Fig. 4a instead of just Fig. 4.

References for the correlative data are given in Table 5 (SOM), as stated in the figure caption of Fig. 4.

The citation of detailed figure numbers is now given.

Figure caption 6: Please define the “Campanian Zone”. Do you mean the Neapolitan area including the Campi Flegrei and Somma-Vesuvius?

We changed the text accordingly.

Figure 8: Re-label “TM-9b upper/TM-9 upper” to “TM-8-1”.

The tephra is re-labeled.

Figure 9: Please add the CI location in the Black Sea according to Nowaczyk et al. (2012, EPSL 351-352, 54-69).

The figure is modified now.

Response to comments of Referee R. Santacroce

1) A table with the average glass compositions is absolutely necessary

A table with the average glass composition is now provided in the main document (Table 4).

2) In the abstract the connection sample-eruption is not necessary: refer only to the eruption

We changed the text accordingly.

3) Pag 4454: undersaturated volcanics in Holocene not only from Vesuvius

We changed the text accordingly.

4) PT0915 – 1: the reason of preferring AD 512 to AD 472 is clear and well discussed, however I remain convinced that AD 472 should be preferred because of its dynamics and magnitude.

We fully agree that the AD 472 could be a possible counterpart of PT0915-1. This is discussed in detail in the text. We tentatively correlated the PT0915-1 tephra with the AD 512 event, because it has a better affinity with TM-2a and proximal AD 512 deposits in geochemical comparison.

5) Most probably Mercato was not a single multiphase eruption but few (2-3-more?) plinian-subplinian different events covering an undefined time span (few centuries?).

We agree with that and stated in the text: "*…which might be a result of multiple explosive phases of the Mercato eruption (Mele et al., 2011).*"

6) PT0915-3 and PT0915-4: To me is not clear the reason to exclude from the possible sources of this cryptotephra the 16,000 BP Greenish Pumice eruption of Vesuvius.

We agree that the Greenish Pumice tephra shows a similar composition as PT0915-3 and -4. However, the Greenish Pumice is too old (19 265±105 cal yr BP; Santacroce et al., 2008), compared with the radiocarbon samples ETH-40060 (12 814±260 cal yr BP), ETH-40062 (13 357±249 cal yr BP), ETH-40063 (12 887±187 cal yr BP) and sample Col1032 (17 159±301 cal yr BP) (Table 1, Fig. 10). Furthermore, distal Greenish Pumice layers, i.e. TM-12 (Wulf et al., 2004) or L8 (Siani et al., 2004) describe often one single layer rather than two separate layers, as observed in core Co1215.

7) PT0915-6: I'm tempted to correlate it to Vesuvius Codola eruption (whose age, dynamics, dispersal and composition are poorly known).

We agree that Codola could be the potential counterpart of PT0915-6. Therefore we simplified the discussion section of PT0915-6 and linked this tephra, for example, with TM-16/Codola. However, there is insufficient information about Codola and PT0915-6 shows partly a different compositional trend than most Codola products, including TM-16 (Fig. 4). Codola tephra particles previously recognized in the Balkan region are porphyritic (microcrystals in the groundmass), while PT0915-6 is glassy. This makes an unambiguous correlation difficult.

8) PT0915-8: "particularly Ischia as its source". Why not Campi Flegrei?

We proposed Ischia as the most probable source because PT0915-8:

a) **has the best compositional match with the SMP1-a eruption, which originated from Ischia Island (Di Vito et al., 2008)**
b) **has an alkali ratio around 1, which is typical for Ischia Island**
c) **shows affinity to Ischia Island according to the Na_2O+K_2O vs. K_2O/Na_2O diagram**