We thank M. Gocke and G. Wiesenberg for their comment on the manuscript. It will help us to expand the discussion part with some interesting additions. Below we address the different issues raised in their short comment:

M. Gocke/ G. Wiesenberg: First of all, the selection of sampling sites might be a bit biased as two soil profiles in till and one loess-paleosol section (LPS) were investigated without sufficient explanation, why these sites are relevant with respect to the aims and combined in the current study. We agree that compound-specific radiocarbon dating is a time- and labor-intensive approach and therefore was performed solely on the LPS, which was the main target of this study. However, the other approach, quantification of the respective biomarkers, includes much simpler analyses, and therefore should have been done also on the LPS for comparison. Otherwise, it is difficult to transfer quantitative results from the till sites to the loess profile. Large differences not only in soil type and thickness, but also climatic conditions, vegetation and thus weathering as well as rooting depth and density do not allow for a direct comparison of both archives.

As outlined (p. 16905 I. 20- p. 16906 l. 2) the aim of combining the LPS and till sections was to have two completely independent approaches to assess the question of stratigraphic stability of biomarkers. Both approaches complement each other to corroborate the conclusions that we draw. Note that compound specific analysis could not be performed in the till profiles due to the extremely low biomarker concentrations in the subsurface. The biomarker concentrations in the Crvenka LPS were measured and published by Zech *et al.* (2013) (see also p. 16907 l. 8- 9) and we agree that a direct comparison of the biomarker concentrations in the till sections should be made to our LPS. Additionally, our revised manuscript now also provides unpublished lipid concentration data from topsoils in Europe, which nicely illustrate that the low biomarker concentrations in the subsurface of soils is observed in diverse environments and is not only restricted to till sections from the Swiss Plateau.

Furthermore, it remains questionable how the authors can identify presence or absence of root-related overprint, if root traces like biopores and rhizoliths were neither assessed quantitatively nor qualitatively, and modern vegetation including roots was also not analyzed. It was recently demonstrated by Gocke et al. (2014) that longchain n-alkanes in ancient calcified roots and surrounding sediment can be strongly enriched in C25 and C27 homologues, which was not regarded in the current study, although the authors found a considerably younger age of these homologues compared to bulk organic carbon, fatty acids and n-alkanes with a longer chain-length. Therefore, this might argue for postsedimentary incoporation by roots and rhizosphere processes. The respective observation was discussed by Häggi et al. in a different way, citing other literature, without taking into account potential root origin as discussed in recent publications.

We are happy to expand on this issue in our revised manuscript. Ancient and modern roots were present in the LPS and the till sections, which would principally make a root related input or overprint possible (see also p. 16907 l. 4-6). However, the extremely low lipid concentrations in the till sections, and the stratigraphically consistent ^{14}C ages in the LPS Crvenka provide strong evidence against significant root-related input of long chain lipids into the subsurface. We acknowledge that our observed trend towards slightly younger ages of the shorter homologues might indicate some small post-sedimentary input or microbial degradation, but in view of the large measurement uncertainties this should not be over-interpreted. From our point of view, the new data published in Gocke *et al.* (2014) does not convincingly show significant root-related input or overprint of long chain alkanes or fatty acids, particularly because one would expect to see gradients away from the rhizoliths to the loess, which is not the case. Moreover, roots of modern plants generally have a dominance of C_{31} and C_{29} homologues (e.g. Dawson *et al.* 2000, Roumet e*t al.* 2006, Jansen *et al.* 2006), which supports our interpretation that younger C_{25} and C_{27} ages are due to microbial activity, reminiscent of the finding of previous studies that the rhizosphere is subject to enhanced microbial activity (Huguet *et al.* 2012).

Additionally, the low sample density at the LPS does not allow for an assessment of the

potential postsedimentary overprint by rooting, as roots and root traces may occur in high abundances at the lower level of a soil or even below a soil or paleosol, as recently observed for various LPS and soil profiles (Gocke et al., 2013).

We will highlight in our revised manuscript that Cr10 at 2 m depth is a sample that would seem to be particularly prone to postsedimentary overprint by roots due to its stratigraphic position below the topsoil and the occurrence of Holocene and/or recent roots. The fact that the bulk organic carbon age is slightly too young, whereas that the long chain n-alkanes show synsedimentary ages (see also p. 16910 l.25-29), nicely corroborates our conclusions.

Other general concerns are related to the general principle of C allocation in soils as published e.g. by Schmidt et al. (2011) for bulk C, and by other authors for fatty acids and alkanes recently. Hence, Häggi et al. argue that almost no allocation of fatty acids and alkanes occurs belowground without giving insight into potential incorporation mechanisms on-site and comparison to other recent studies.

Since there is no allocation of long chain fatty acids and n-alkanes in the subsurface of the till sections, there seems to be no quantitatively important incorporation mechanism for those compounds (see also p.16910, l. 6). Therefore, there is no need for an in-depth discussion of potential incorporation mechanisms.

Another shortcoming is the comparison of the results from Crvenka with marine sediments, whereas existing literature on terrestrial settings (e.g. Bol et al., 1996; Huang et al., 1996; Rethemeyer et al., 2004a, b) related to 14C ages of various lipid fractions was not included in the discussion.

The comparison with marine sediments and soils is an insightful perspective for the discussion of the compound specific results, since this is the first study using compound specific radiocarbon dating in loess and there are little other possibilities for comparison. The papers mentioned by Gocke and Wiesenberg indicate that radiocarbon ages of bulk lipid fractions of soils are generally older than the bulk organic matter (Bol *et al.* 1996, Huang *et al.* 1996). The difference is attributed to (non-lipid) mobile and post-sedimentary components in the bulk organic matter, and is in very good agreement with our findings and conclusions: "The survival and apparent stratigraphical stability of these recoverable aliphatic hydrocarbons provides the opportunity, via the development of AMS dating, to measure an unambiguous radiocarbon age for the origin of organic residues retained in soils and sediments" (from the abstract of Bol et al.). Rethemeyer *et al.* (2004) describe the occurrence of fossil carbon in soils of industrialized areas. Compound specific radiocarbon dating might be very useful in such a setting, as the anthropogenic influence and the fossil carbon contamination should preferentially result in older *even* chained *n*-alkanes in Cr1 (see also p.16911 lines 21ff).
We will expand on both issues in the revised version of the manuscript.

A lack of information of the study is related to the statistical evaluation of the data, i.e. if 'significant' is related to what common readers understand as statistically relevant.

The term 'significant' will be exclusively used for its statistical meaning in the revised version of the manuscript.

p. 16913 l. 9: 'input of leaf-wax lipids by roots' can lead to misunderstandings. How can roots produce leaf-wax lipids?

Changed to plant wax lipids in the revised version of the manuscript.

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