

**Reply to Prof. Dr. Eva Lehndorff (Referee #2) and Prof. Dr. Petr Kuneš (Handling editor)**

by Marcel Lerch & co-authors

Dear Prof. Dr. Eva Lehndorff & Prof. Dr. Petr Kuneš,

thank you very much for your constructive and valuable suggestions how to further improve our manuscript. Please find our point-by-point reply to your comments below.

***Point-by-point reply to the comments:***

*Line 22-23: Provide motivation for Fotsch as adequate reference (can be said in few words)*

→ Maybe a misunderstanding? Please note that the Ullafelsen is situated in the Fotsch Valley. Anyway, we slightly changed the sentence as follows: *“In order to study the human and/or livestock faeces input on the Ullafelsen, we carried out steroid analyses on 2 modern ruminant faeces samples from cattle and sheep, 37 soil samples from seven archaeological soil profiles and 9 soil samples from five non-archaeological soil profiles from the Fotsch Valley used as reference sites.”*

*Line 27-28: Good that you can show it, but I wouldn't mention this detail in the abstract as it is not your focus*

→ We prefer to maintain this sentence, if you agree, because potential leaching/translocation of faecal biomarkers indeed is an important potentially limiting factor.

*Line 30-31: It's completely confusing to me to speak about the plant sterols. They are in every topsoil and don't have an influence on faecal steroids. To keep the focus, I suggest to delete this from the abstract. The abstract is quite long and would benefit from a focus on the faeces.*

→ Deleted

*Line 71: Maybe soften this to „as suggested by previous analyses“ (Zech...).*

→ Changed as recommended

*Line 134-138: The English botanical names should come with capital letters (European, Norway, etc.)*

→ Changed

*Line 151-153: Please add information about the reference soils. Where have they been sampled? Why do you expect these soils to be free of faecal or being useful as a reference?*

→ Added and we refer our readers again to Table 1 providing the exact coordinates. Indeed, we did not expect the reference soils to be free of faecal biomarkers because livestock grazing occurs also at the reference sites. Rather, the reference results help to assess whether the faeces input on the Ullafelsen was/is strikingly higher compared to the reference sites. According to our results (Fig. 5), it is slightly but not substantially higher.

*Line 302: “faeces”*

→ Changed

*Line 303: It's rather „human-related“*

→ Changed

*Line 342-343: Any idea why the steroids don't show up in the Bh? (just curious)*

→ Bh horizons are subsoils and therefore no direct faeces input occurred. Our results moreover give evidence that leaching into subsoil horizons can be excluded (see line 398-400). The occurrence of  $\beta$ -sitosterol in the Bh horizons can be explained with root input (see line 352-357).

*Line 396-397: This seems to be a speculation as you don't know what kind of signal wild life would have, don't you?*

→ You are right. We therefore softened the formulation: *"We suggest that the faeces input by wild animals such as chamois, marmot or fox can be neglected due to the high density of ruminant species at the Ullafelsen and surroundings."*

*Line 406-408: I don't get the message from this sentence*

→ We agree: deleted.

*Line 409: For better understanding I suggest to begin the following sentences always with the fully written ratio. What about ratio 4, shouldn't it be mentioned before ratio 5?*

→ We agree. Following your suggestion, we added in brackets the fully written ratios at the beginning of each section in chapter 3.3. We also changed the order of ratio 4 and ratio 5.

*Line 437-438: To follow this recommendation while reading the text, it would be better to fully give the ratio first (e.g. is an epi-5 $\beta$ -stanol included in ratio 4?)*

→ Changed

*Line 456-457: Phrase shortened*

→ Changed as suggested

*Line 458: "prehistoric"*

→ Changed

*Line 459: "at"*

→ Changed

*Line 461-462: For me this is not part of this study.*

→ Deleted

*Line 488: "and"*

→ Changed

*Line 496: "and"*

→ Changed

*Line 496-497: This is unnecessary, since the information will be provided separately.*

→ Changed