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Interactive comment on "Distributions of glycerol dialkyl glycerol tetraethers in surface soils of Qinghai–Tibetan Plateau: implications of GDGT-based proxies in cold and dry regions" *by* S. Ding et al.

H. YANG

yhsailing@163.com

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This paper provides valuable soil GDGT dataset from a cold and dry region, the Qinghai-Tibetan plateau(QTP), which is a hotspot for studying the paleoclimate change. This manuscript is generally well written. However, several issues should be addressed before it can be accepted for publication in Biogeosciences.

Introduction Developing or testing new proxies is of significant importance in paleoenvironment reconstruction. However, I am not quite clear about the purpose of the new

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calibration of MBT/CBT in this paper because there is no loess-paleosol sequence in the QTP. Paleoclimatic reconstruction in the QTP largely depends on the lacustrine or fluvial-lacustrine sediments, where the soil MBT/CBT calibration does not fit for the paleotemperature reconstruction. The authors therefore should re-consider the purpose of this research.

P487 Line 5 'The local climate is dry and cold with MAT of 0.1 °C and MAP of 317 mm'. I think the MAT can vary in a large amplitude due to a wide range of elevation (3066 to 5418 m). It is not easy to obtain the exact meteorological information for each sampling site as few meteorological stations were established in the QTP.

P488 Testing the method only in Chinese loess plateau is far not enough to support its applicability in the QTP. How the final calibration looks like will be largely determined by these environmental parameters. The meteorological data in the QTP, though limited, can be obtained from a number of literatures and websites. The authors should clearly show that the method used is applicable to the QTP, especially because the QTP has a very complex landscape.

P488 Line 1-5 It is really not clear which season or months are the most humid or most warmest quarters in the QTP. Please be more specific.

P488 Line 17-20 Huguet et al. (2006) should be cited because these authors proposed this internal standard.

P489 Line 3 The authors used a different elution gradient than the previous studies. An increase in the amount of B phase from 10% to 80% in 45 min seems to be a little bit large for GDGTs separation, and in turn the separation of GDGTs will be inevitably affected. The authors need to show the chromatogram of GDGTs.

P490 Line 6 It is not reasonable to compare the concentration of GDGTs measured with different LC-MS because each instrument has its own response factor. The GDGT concentrations for two data sets both have wide ranges, and it seems to be a little bit far-

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fetched to say one data set is lower than another unless you perform an independent t-test on these datasets.

P490 Line 11-13 'iGDGTs are mainly of an aquatic archaea origin' This statement is not right. In some soils, iGDGTs can be very abundant and they mainly derive from soil Thaumarchaeota. This part needs to be re-written.

P490 Line 15-20 The authors omitted some important references, e.g. Yang et al.(2012, 2014) and Xie et al. (2013) because these papers investigated Chinese soils in a larger area and found low BIT values are widespread in alkaline and dry soils.

P490 Line 15-20 'All these results support the existence of in-situ production of iGDGTs in the QTP soils'. It seems to be not necessary to conclude like this because iGDGTs have no other sources other than soils.

P490 Line 20-23 Soil moisture appears to be an important factor controlling the BIT in soils. The authors should specify the relationship between soil moisture and BIT and then reach the conclusion.

P490 Line 24 'favorite' changed to 'favorable '.

P492 Line 3-5 'when all three variables are considered to the dataset'. This sentence is unclear. Pls rephrase.

P492 Line 15-20 'In some semiarid and arid regions, a strong correlation between MAP and MBT was observed (Dirghangi et al., 2013; Menges et al., 2014). I didn't see very strong correlations between MAP and MBT in above two papers. Instead, the relationship is weak. The authors should at least provide the R2 and Pearson coefficient to demonstrate there are strong correlations between MAP and MBT. In fact, the MBT' has a much stronger correlation with soil pH than with MAP in Menges et al. (2014). ' a possible relationship between MAP and MBT' may be more appropriate.

P493 Line 9-10 'Compared to soil pH, temperature and precipitation have much weaker influence on CBT (r2 = 0.44 and 0.03; Fig. 5)' The R2 does not correspond to the

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previous environmental parameter. Please revise.

P494 Line 5-15 It seems to be not logical to develop a calibration of MBT, CBT, and MAT or MAP here because MBT has no strong correlation with either MAT or MAP in the QTP. The recent calibrations of MBT/CBT all depend on the strong correlation between MBT and temperature.

P496 Line 1-2 It is not reasonable to say 'our new calibration has successfully extended the minimum applicable threshold from 5 to -5 °C 'here due to the following reasons. First, the Eq.(12) only provided the RMSE for the total dataset. However, this RMSE may be largely determined by the GDGT data compiled from other publications because your dataset comprises only a relatively small proportion of the total dataset. I am not clear about the performance of this new calibration for MAT reconstruction in the QTP alone. In most cases, the aim of developing new calibrations is to reduce the scatter and to improve the accuracy of paleoenvironmental reconstruction. The authors should provide the residual errors generated by the Eq. (12), Chinese calibration (Yang et al., 2014) and the Peterse et al(2013) global calibration to compare whether the new calibration has a better performance.

P496 Line13-15 'The reason for the slight bias of MBT-CBT towards winter season is that although more amounts of bGDGTs are produced in summer, more variation in bGDGT compositions occurs in winter'. This sentence is not logical' Did the authors analyze the correlation between winter T and MAT? In fact, these two parameters were highly correlated in Chinese region (Yang et al., 2014).

Figure 4 The authors should add MBT and CBT to the RDA triplot to show the relationship of them with environmental variables.

Interactive comment on Biogeosciences Discuss., 12, 481, 2015.