Interactive comment on "OPTiMAL: A new machine learning approach for GDGT-based palaeothermometry" *by* Yvette L. Eley et al.

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This manuscript presents a new approach, 'OPTiMAL' to improve the accuracy of palaeo sea surface temperature reconstruction, in particularly focusing on the GDGT data from greenhouse worlds. The effort of improving the sea surface temperature reconstruction is welcome. As an organic geochemist without enough knowledge of machine learning, it is difficult for me to understand some parts of the manuscript as most parts of the discussion show how the model was established and what the performance of this model was. I can understand the rationale of the model used in this manuscript: GDGT data should have 6 dimensional information and machine learning approach used in this study can capture the 6 dimensional information, which appears to be better than one dimensional information shown by TEX86. However, I strongly

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suggest the authors should be cautious when discussing the TEX86 and its derivatives because these proxies are still applicable in most cases and in most work of palaeo-SST reconstruction in the greenhouse world, these proxies are still applicable. The authors should also carefully check the manuscript as there are a number of typos. In particular, the reference list should be checked carefully. Some minor points are appended below. Line 52 'LC-MS' Full name should be shown here. Line 60-61 References should be arranged in the time order. Line 63 Zhaung should be Zhang. Line 73 'in response to these criticisms' Better to use other words. Line 77 'Kim et al. 2010' should be 'Kim et al., 2010'. Line 90 'Hollis et al. 2012; Dunkley Jones et al. 2013; Lunt 2012' should be 'Hollis et al., 2012; Dunkley Jones et al., 2013; Lunt 2012' . The references should be listed in the time order. Line 95 Add comma after 'et al.' Line 96 Delete the comma after 'production'. Line 97 'ðİŚĞðİŘÿðİŚŃ86L is no longer regarded as an appropriate tool for palaeotemperature reconstructions'. This proxy is still applicable in most marine regimes and could be used to infer SSTs. Line 103 'BIT' should be shown in full name Line 104 Add comma after 'et al.'. Line 131 'crenarchaeol regioisomer' Line 192-193 I think data from Tierney and Tingley (2015) do not cover all the published core-top GDGT data. A number of other data published recently should also be included. Line 228 Delete 'the crenarchaeol regio-isomer' and you can use cren' here.