

**Review on bg-2019-15 “Long chain diols in settling particles in tropical oceans: insights into sources, seasonality and proxies” by de Bar et al.**

This manuscript investigates long-chain diols (LCDs) in sediment trap time series from five tropical sites (tropical North Atlantic, Cariaco Basin, Mozambique Channel) to assess seasonal variations in fluxes of LCDs and associated proxies (Long chain Diol Index and Diol Index). These data are compared with other lipid proxies (alkenones and GDGTs) and previous published data (primary production, SST,..). Results show that surface sediment LDI temperatures in the Atlantic and Mozambique Channel compare well with the average LDI-derived temperatures from the overlying sediment traps, as well as with decadal annual mean SST. In the Mozambique Channel and the tropical Atlantic, the LDI temperatures reveal minimal seasonal change although there are clear seasonal SST contrasts, which is likely due to lateral advection of re-suspended sediment. In the Cariaco Basin, a strong seasonality in the LDI is observed, which is linked to the upwelling season and stratification of the water column. In addition, in the Atlantic, the Diol Index reflects a pre-upwelling signal, whereas in the Cariaco Basin, the Diol Index seems to be an indicator of upwelling intensity.

This paper is a valuable contribution to the understanding of the seasonal production of LCDs in marine environments and how it is translated in the temperature proxy LDI and the Diol Index (upwelling proxy). A strength of the paper is that the LCD data has been compared with other available data for each site (primary production, SST, alkenones, GDGTs,...), which gives a broader picture and supports the interpretations based on LCDs. The writing style is clear and precise and the interpretations are generally supported by the data. This manuscript is thus suitable for Biogeosciences. However, the current manuscript could be improved before publication. Please find my comments below.

**General comments:**

Diol index and upwelling: The authors argue that, in the Cariaco Basin, the Diol Index is an excellent indicator of upwelling intensity (Lines 476-480). However, when looking at the 1999-2000 time series, high values of the diol index actually occur when the primary production decreases. What are the  $R^2$  values (and  $p$  values) that justify “a strong correlation with primary production rates”?

In addition, for the eastern Atlantic (M1 trap), the authors argue that the Diol Index reflects a pre-upwelling signal, consistent with the current knowledge on *Proboscia* ecology (Lines 509-526). I would like to see more discussion that explains why at one location the Diol index indicates pre-upwelling conditions, whereas it seems to be an indicator of upwelling intensity at another location.

Keto-ols as oxidation products (Lines 578-586): An alternative explanation for the non-detection of 1,14-keto-ols would be that keto-ols are not oxidation products of LCDs, but rather produced by unknown organism(s) (Versteegh et al., 1997). Previous studies have indeed shown the absence of evidence of conversion of diols into their corresponding oxidized keto-ols (Jiang et al., 1994; Méjanelle al 2003; Shimokawara et al., 2010). I think the authors should acknowledge this.

*References:*

- Jiang, S.C., O'Leary, T., Volkman, J.K., Zhang, H.Z., Jia, R.F., Yu, S.H., Wang, Y., Luan, Z.F., Sun, Z.Q., Jiang, R.H., 1994. Origins and simulated thermal alteration of sterols and keto-alcohols in deep-sea marine sediments of the Okinawa Trough. *Organic Geochemistry* 21, 415-433.
- Méjanelle, L., Sanchez-Gargallo, A., Bentaleb, I., Grimalt, J.O., 2003. Long chain *n*-alkyl diols, hydroxyl ketones and sterols in a marine eustigmatophyte, *Nannochloropsis gaditana*, and in *Brachionus plicatilis* feeding on the algae. *Organic Geochemistry* 34, 527-538.
- Shimokawara, M., Nishimura, M., Matsuda, T., Akiyama, N., Kawai, T. 2010. Bound forms, compositional features, major sources and diagenesis of long chain, alkyl mid-chain diols in Lake Baikal sediments over the past 28,000 years. *Organic Geochemistry* 41, 753-766.
- Versteegh, G.J.M., Bosch, H.J., de Leeuw, J.W., 1997. Potential palaeoenvironmental information of C<sub>24</sub> to C<sub>30</sub> mid-chain diols, keto-ols and mid-chain hydroxy fatty acids; a critical review. *Organic Geochemistry* 27, 1-13.

Figures: I think the current order of the figures does not necessarily follow the logic of the results/discussion. For more clarity, I would suggest modifying the order as follows: Fig. 2 should be Fig. 9; Fig. 3 should be Fig. 2; Fig. 4 should be Fig. 8; Fig. 5 should be Fig. 3; Fig. 6 should be Fig. 4; Fig. 7 should be Fig. 5; Fig. 8 should be Fig. 6; Fig. 9 should be Fig. 7.

#### **Specific comments:**

Line 25: specify “with emphasis on the temperature proxy Long Chain Diol Index”.

Line 27: specify “similar to the two other lipid-based temperature proxies TEX<sub>86</sub> and U<sup>K</sup><sub>37</sub>”.

Line 27: “In addition” instead of “However”.

Line 29: Could be rephrased as: “In contrast, the LDI in the Cariaco Basin shows larger seasonal variation”.

Line 48: Need references.

Lines 48-50: Could be rephrased as: “However, research showed that despite their highest abundance being recorded in the upper 100 m of the water column, Thaumarchaeota can be present down to 5000 m depth (Karner et al., 2001; Herndl et al., 2005)”.

Line 69: “for autumn to summer” should be “for autumn and summer”.

Figure 1: indicate in the caption what NEC, NECC, SEC, MC, GD, NBC and GC stand for. Is it possible to add the position of the ITCZ during the boreal winter?

Line 200: What are CTD measurements?

Line 256-258: Could diols be found in the DCM:MeOH (1:1; v/v) fraction? Have you checked?

Line 369: Should be as: “C<sub>28</sub> and C<sub>30</sub> 1,13- (0–3 %), the C<sub>30</sub> 1,15- (44–99 %), and the C<sub>32</sub> 1,15-diols (0–7 %)”.

Lines 367-376: I think a table showing the presence/absence for each diols (and the % of total LCDs) at the different traps (M1, M2,...) and different sites (Atlantic, Mozambique Channel, Cariaco Basin) would be useful to clearly see which diols are detected for each location. The Figure 2 is used to discuss the preservation between traps and sediments rather than showing the diols detected.

Line 392: Fig. 5 is cited before Fig. 4. I think the order of the figures should be changed (see previous comment).

Line 397: cite Figure 7.