Clim. Past Discuss.,
https://doi.org/10.5194/cp-2019-70-RC2, 2019

Climate of the Past Discussions

Interactive comment on "Millennial-scale variations of sedimentary oxygenation in the western subtropical North Pacific and its links to the North Atlantic climate" *by* Jianjun Zou et al.

Anonymous Referee #2

Received and published: 24 July 2019

Zou et al., present a rather interesting study focusing on reconstructing the oxygenation history in the Okinawa Trough covering the last 50 kyrs. Specifically, the authors attempt to disentangle the typically confounding influence of export production (and by inference the oxygen consumption related to organic matter degradation) and bottom water ventilation on the sedimentary redox condition. Their geochemical records largely corroborate previous findings in that oxygenation patterns at intermediate depths in the North Pacific were primarily controlled by the production and ventilation of North Pacific Intermediate Water. Specifically, conditions were generally better oxygenated during stadials, when NPIW was generally better ventilated and vertically expanded. Furthermore, their data support a general expansion of oxygen-depleted waters at in-

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termediate depths during the B/A occupying large swaths of the North Pacific.

The manuscript is well documented and quite detailed in places. The argumentation could be somewhat streamlined (see comments below) and would certainly benefit from editorial support. I would also recommend the argumentation to focus on the aspects outlined in the title and abstract.

l. 35 – deep ocean carbon sequestration is certainly one the reasons potentially explaining lower glacial pCO2 concentrations, but certainly not the only one. Please rephrase to avoid unnecessary confusion

l. 36 – I would suggest rephrasing as follows – However, the potential role of subtropical North Pacific subsurface waters in modulating. . .

l. 48 and throughout – why is HS1 so much different from HS2 when considering their respective oxygenation history?

l. 62 – agreed. But I would add that in addition of the flushing of a poorly ventilated deep water mass upon the resumption of NADW, many export production records show a drastic increase during the B/A (e.g. Kohfeld & Chase, 2011), which could account for enhance oxygen removal associated with organic matter respiration upstream of the core site location.

l. 70 – AT the sediment-water interface

l. 83 . . . in marine sediment cores

l. 86 . . . in the subarctic North Pacific.

l. 92 – I would suggest to briefly explain what cabbeling means

l. 96 and throughout (incl. Fig. 6) – this may well be a semantic issue, but benthic d13C cannot be considered as a ventilation proxy per se, as the isotopic value can be obfuscated by air-sea gas exchange in locations where subsurface water masses form.

l. 151 – processes that are related to the supply of oxygen by ocean circulation and. . .

l. 163 – technically one should specify that under reducing conditions it is the authigenic fraction of Mn (as opposed to its detrital background) that remains low.

l. 168 – please add adequate reference

l. 195 – volcanism

§3 – I would suggest to substantially shorten this paragraph as the general oceanographic setting is already outlined in the introduction. I would recommend focusing on the aspects directly relevant to the argumentation (nutrient, dissolved O2).

l. 287 – why is the sedimentation rate so high during HS2 when both export production and detrital input (based on Al) are low? I would suggest verifying the age pointers for that interval.

l.291 – 85 samples covering 50 kyrs cannot provide an average time resolution of 200 yrs.

l. 345-346 – Maybe. But it may also suggest that the sedimentary CaCO3 content could be directly controlled by dilution. I would interpret the export productivity records with caution.

l.371-372 – interesting idea!

l. 427 – supply seems more adequate than provision.

l. 487-488 – please also consider citing Galbraith et al., 2007.

l. 489-490 – please keep in mind that O2 can be consumed upstream of the core site location as the removal of O2 in relation to organic matter degradation is integrated over the flow path of a give subsurface water mass.

Fig. 6C – shouldn't the grey triangle right of the vertical axis be flipped upside down (i.e. high Mo/Mn coincident with low oxygenation)?

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