We would like to thank Dr. Curt J. Stager and the anonymous reviewer for their insightful and constructive comments and suggestions. Below, we address the reviewers' suggestions, comments, and concerns. The original reviewers' comments are highlighted in italic and followed by our responses highlighted in bold letters.

Comments and suggestion by Dr. Stager (Referee)

This article presents interesting and useful new information regarding Holocene climatic changes in the winter rainfall zone of southern Africa, offering marine-based information in support of existing terrestrial records.
The methods appear to be sound and the multi-proxy approach helps to support the conclusions made in the article, most of which I find convincing. However, this approach also presents the risk of confusing readers such as myself who are not as accustomed to working with these paleo indicators as the authors are. This is especially important when each proxy can have multiple environmental interpretations (grain size = source area and/or wind strength, 18C = salinity and/or temperature, 13C = upwelling and/or river discharge, etc.). I therefore recommend including a simple summary paragraph or table of what each proxy is taken to mean (13C, 18O, K/Al, Ti/Al, etc.) along with the presumed condition of each environmental system (position of westerlies, humdity, upwelling strength, SST, etc.) to help guide the reader while evaluating the text and the data.

Following Dr. Stager's recommendation, we provide a table (Table 3) that summarizes the analyzed parameters and their environmental interpretations.

On page 2294, for example, the authors explain that reduced delta-13C means stronger upwelling (lines 23-24) and/or reduced river input (lines 14-15), which presumably would be expected under drier climatic conditions associated with poleward drift of the westerlies. This seems to suggest a negative correlation between upwelling and humidity. On page 2298, however, aridification is linked to weakening of the BUS (lines 7-8), suggesting a positive correlation, and on page 2301 (lines 20-25), stronger up- welling is linked to more humid conditions and equatorward drift of the westerlies. After multiple readings I am still having trouble keeping it all straight - probably due in part to my own limitations, but still reasonable grounds for a reader to request more clarification.

We would like address the above comment in two steps:

1) On the influence of riverine dissolved inorganic carbon (DIC).
A core top study (Meadows et al., 2002) shows that the contribution of DIC and organic matter from the Orange River declines rapidly towards the southwest. About 20 km southwest of the Orange outflow, the $\delta^{13}C$ values of core-top vary between -16.2 ‰ and -17.5‰, suggesting significant imprint of "C4 plant". Approximately 42 km southeast of from the Orange River mouth, the average value of $\delta^{13}C$ in organic matter is ~ -19.8 ‰ that is close to the average value of marine organic matters (varying between -20 and -21 ‰) (Meadows et al, 2002). Our core site is approximately 57 km off the Orange River delta. Therefore, the influence of riverine DIC over our site most likely is very weak, and wind-induced upwelling of demineralized marine organic carbon provides the dominant source of DIC. Therefore we interpret that a relatively negative (positive) $\delta^{13}C$ signature indicates a strengthening (weakening) of the southern Benguela Upwelling System (BUS). We clarified this issue in page 13-14 (line 26-2).

2) According our multi-proxy record, a relatively strong (weak) southern BUS is accompanied by relatively wet (dry) climate conditions in the coastal area, a northerly (southerly) position of the austral westerlies, and reduced (enhanced) Agulhas water leakage. The strongest evidence that poleward shift of austral westerlies is accompanied by enhanced Agulhas leakage, aridification of western South Africa, and weak southern BUS comes from our mid Holocene record. Analogous to modern observation, we suggest that during the mid Holocene the leakage of warm Agulhas into the southeastern Atlantic, as suggested by foraminiferal assemblage, modifies the near-surface thermal structure of water column and weakens the southern BUS. We have clarified this aspect of our observation in page 14-15.

One unresolved point in particular is the climatic interpretation of nssCa in Antarctic ice cores. In most of the article, higher nssCa is taken to represent poleward retreat of the westerlies, which makes intuitive sense if the dust-bearing westerlies move closer to the site of deposition. However, in our cited Verlorenvlei paper (Stager et al., 2012) we found rising nssCa at Siple Dome associated with rising precipitation in the WRZ during the last 600 years or so. We hypothesized that this indicated more dust delivery to Siple Dome as a result of EQUATORWARD drift of the westerlies, which would bring more winter rain to the WRZ and also reach more landmass in the southern hemisphere from which dust could be transported. The authors are therefore left in the unenviable position of dealing with multiple interpretations of this particular proxy as well. However, if the ice core records are to be used in the figures, then these opposing interpretations need to be addressed somehow in the text. One possible key to resolving this is the complexity of atmospheric circulation over Antarctica; for example, the Siple Dome snow chemistry doesn't necessarily have to vary in lockstep with that from the EPICA coring site.

Indeed, there exists different view with the regard to the interpretation of nssCa+ in Antarctic ice cores.

- **Stager et al (2012) hypothesize that increase of accumulation rate of nssCa+ in Siple Dom ice core indicates equatorward shift of austral westerlies during the LIA.**
- **In contrast, we suggest that an increase (decrease) of accumulation rate of nssCa in EPICA Dom C ice core reflects poleward (equatorward) drift of the westerlies during the Mid-Holocene (the LIA)**

An independent indicator of latitudinal shift of the austral westerlies is changes in the amount of Agulhas water leakage into the Southern Atlantic. Modern observation shows that poleward shift of the westerlies enables an enhanced leakage of warm and saline water into South Atlantic. During the middle Holocene planktonic foraminferal assemblage suggests enhanced Agulhas leakages concomitant with an increase of nssCa accumulation over EPICA Dome C and weakening of the southern BUS (Figures 6A-D), suggesting that a poleward shift of the austral westerlies promotes an increase in nssCa+ deposition over eastern Antarctica (EPICA).

It is also not clear whether the nssCa+ accumulation rate in Siple Dome does necessarily have to co-vary in synch with that from the EPICA coring site. Location and altitude of the ice cores may have played a critical role in shaping the difference in the trend of nssCa accumulation rate over Simple Dom and EPICA Dom C.
In the revised version, we point out to the divergent trend of nssCa in Siple Dom and EPICA Dom C during the LIA. For discussion see page 18-19 (line 3-18)

I was also a bit confused by some aspects of the LIA history. To my eye, it seems as though delta-13C declined during the 500-300 BP interval, and on Figure 7 this indicates stronger upwelling as well as southward drift of the westerlies (Fig 7A). However, southward drift would apparently be contradicted by the Verlorenvlei evidence of wetting (Fig 7K), the abstract links stronger upwelling to wetter climates and equator- ward drift of the westerlies, and on page 2301 (lines 9-10) the text says that upwelling declined during that time period. Please clarify?

Again, during the LIA our study reveals linkages between:
- a strengthening of southern BUS, as suggested by declining $\partial^{13}C$
- humid climate in the coastal areas of Western South Africa, as indicate by our humidity index that is consistent with the findings by Stager et al. (2012) and Benito et al. (2011)
- northerly position of the austral westerlies, as suggested by low nssCa accumulation rate relative to pre-650 years BP. We note there are multi-decadal oscillations of nssCa within the LIA. We focus, however, on the multi-centennial scale trend.
In page 21 (line 19-24) we have clarified our statement.

In addition, on page 2299, lines 10-11, the Tyson et al citation of dry climate seems to contradict the interpretation of wetter conditions, but without explanation.

The observation of wet conditions in the coastal area of western South Africa (WRZ) concomitant with dry conditions in eastern South Africa (SRZ) is consistent with the conceptual climate model described by Tyson et al.

Some other minor suggestions:
1. I would avoid the term "amelioration" when referring to climatic changes, as it is based on undefined human preferences and can have multiple interpretations. If it became drier or warmer, for example, then better to simply say that it became drier or warmer.
2. A map of the mudbelt might be useful, though not absolutely necessary. 3. Typo on page 2285, line 20 (Drakensberg)
4. Additional editing for English usage suggested

We took care of all minor suggestions. The English have been edited.