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Climate of the Past Discussions

Interactive comment on "Glacial-interglacial vegetation dynamics in south eastern Africa depend on sea surface temperature variations in the west Indian Ocean" *by* L. M. Dupont et al.

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We address Louis Scott's suggestions, questions, and comments point for point. His quotes are marked between » and «. Our answers are preceded by 'A:'

»2262, 13, 2275, 16, 17 and 2277, 24: A question arises from the abstract that while sea surface temperatures were colder so were the air temperatures (as mentioned in 2275, 16), but it is not clear why only the sea surface temperatures should be seen as the main cause for the long term vegetation cycle (also stated in the title). There is evidence that sea surface temperatures are associated with moisture conditions during the Holocene and at present, but can we extrapolate this over 300 000 years? I do

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not think the suggestion that lower precipitation is related to glacial vegetation is well founded over this time scale without other independent data to support it. Ericaceae do not seem to support lower precipitation because at present species on the eastern side of Southern Africa usually occur under relatively moist conditions.«

A: We do not assert that sea surface temperatures are the ONLY effect on South African vegetation; however, our data clearly indicate that they are tightly coupled. Moreover, the correlation with the stable oxygen isotopes or with the temperature record from Dome C is less good than with the SST suggesting a strong regional component. As this is the unexpected and, therefore, the most interesting part of the story we emphasise the result in the title. Maybe the term "depend" is too suggestive of causality. We change the title into "Glacial-interglacial vegetation dynamics in south eastern Africa coupled to sea surface temperature variations in the western Indian Ocean".

In section 6.4 (at page 2275) we discuss why the mountainous vegetation co-varies with Indian Ocean surface temperatures. As you rightly comment there is a problem, because the vegetation would indicate cooler conditions compared to the present, while according to physical principles drier conditions in South Africa are expected when sea surface temperatures decline. We explicitly point to this paradox (page 2275, line 18), and conclude at the end of the paragraph that cooler temperatures might have been the driver. In the abstract we state that we found the correlation but we do not state that mountainous vegetation is specifically drought resistant; only, that Podocarpus forest occurs during the more humid phases of glacial periods. It might be that our wording at line 13 on page 2275 has lead to the misunderstanding. We'll therefore change "accentuates the" into "suggests a". Interestingly, Referee #1 does not see any implied paradox and underlines our conclusion. We change the paragraph to pick up the suggestions of the Referee#1 and hope that the text is clearer now.

»2262, 16: An affinity of taxa like Ericaceae and Passerina to the Cape Flora (of the Fynbos Biome) is not questioned but this not relevant here because this biome is far

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away from the study site. Where “Fynbos” is mentioned it may be good to write it without a capital in order not to imply the Fynbos Biome of the Cape but rather fynbos as a general term for a vegetation type that occurs in high-lying cool, wet parts of the Grassland Biome (Mucina and Rutherford, 2006).«

A: Will be changed to "including fynbos-like species of the high-altitude Grassland biome"

»In 2272, 9, the phrase "nowadays growing in the Cape" seems to be irrelevant. Although rare pollen grains from the Cape Fynbos Biome might arrive at the study site by long-distance wind transport, fynbos species in the Grassland Biome on the escarpment are much closer to the study site and produce high pollen loads (Scott, 1982 a&b; Scott, 1989).«

A: Will be changed to "as found in high-altitude cool, wet parts of the Grassland Biome; Mucina and Rutherford, 2006"

»Further, some Passerina pollen could also represent Indian Ocean coastal dune vegetation (see Mucina and Rutherford, 2006; Neumann et al., 2008, 2010).«

A: In combination with the other elements that score on EM2, we prefer the interpretation of mountainous element.

»2263, 3: I am not sure that “all others” suggest that the southern Cape received summer rain; Bar-Matthews et al. (2010), yes, but Lee-Thorp and Beaumont’s work at Equus Cave is not from the Southern Cape, nor is Partridge’s study of Tswaing.«

A: Will be changed to "Others argue that most of South Africa remained under summer rain influence (Lee-Thorp & Beaumont, 1995; Partridge et al., 1999), even including the southern Cape (Bar-Matthews et al., 2010)."

»2262, 20-22: Can the winter-rain area be considered as subtropical? Is it not something in between the sub-tropics and temperate region while the summer rain area in South Africa is actually subtropical?«

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A: We'll delete "subtropical".

»2263, 11: delete" heavily"«

A: OK

»2264, 4: Is the Inter Tropical Convergence Zone is not a relatively wide phenomenon so that its influence can therefore be much further south than where the line where air masses converge is usually mapped?«

A: Yes, we delete the line.

»2264, 16: Drakensberg«

A: OK

»2255, 9: I am not sure why discussion of conditions on the southern coast is relevant here. This could be deleted.«

A: The mentioned pressure cells start from Cape Town and travel all along the coast beyond the southern coast far to the north. We'll change the text into: "creates coastal shallow low pressure cells associated with Bergwinds"

»2272, 16: Tribulus occurs as pioneer all over Southern Africa and should not be seen as coastal vegetation. Maybe it is more closely associated with the halophyte group than coastal vegetation even though it is no halophyte.«

A: We'll change the text to "coastal vegetation, mangroves (Rhizophora), pioneer taxa (Tribulus), and halophytes"

»2272, 29: When?«

A: Unfortunately this is not stated in the paper of Van Campo et al. (1990) and the diagram never has been published properly.

»2276, 4: endmember (lower case)«

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A: OK

»2276, 9: Meaning not clear, at least not to those not experienced in these techniques.«

A: Because the endmembers together are 100%, the third endmember is fixed if the other two are known. Thus, the variability of the third endmember is influenced by the other two, which affects the spectral analysis. The spectrum of the EM3 would include lines of EM2 and EM1.

»2277, 2: Move the word “depends” further down the sentence.«

A: OK

»2277, 16: The phrase “complete climatic cycles” could be more specific, e.g., 300 ka or three orbital or glacial/interglacial cycles?«

A: OK

»Fig. 1: Tswaing could be shifted slightly northward not to lie in the Highveld.«

A: OK

»Fig. 2: Forest trees could be “Forest trees minus Podocarpus” or just “Other forest trees”.«

A: OK

»Fig. 7: Spelling of coherency«

A: OK

Interactive comment on Clim. Past Discuss., 7, 2261, 2011.