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Climate of the Past Discussions

Interactive comment on "Increased aridity in southwestern Africa during the last-interglacial warmest periods" *by* D. H. Urrego et al.

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The article contains an interesting marine pollen sequence but I feel it is my duty as someone who is acknowledged in it, to point out some serious short comings that should be corrected before this paper is published. There are problems with the modern pollen control, a lack of consideration of previous literature in the study region and some unwarranted speculations that result in vague and meaningless interpretation of vegetation changes on the Southern African continent. The pollen sequence without the modern pollen results may be publishable provided but that the interpretation is done very carefully and the limitations of marine pollen spectra in tracking vegetation boundaries on land are realized. The modern pollen survey seems to be flawed and I recommend that it should not be published. I believe too much is read from the pollen

sequence of the marine core relying on pollen that is a mixture derived from a vast continental area hundreds to thousands of kilometers away from the pollen sources. There is no way of distinguishing which grass pollen comes from the temperate sub-humid grassland, tropical savanna grasslands, karroid shrub-lands or desert grasslands.

Further I picked up the following points that need attention.

P 4326, line 20: Relatively humid Namibian desert grassland is not really shown by Scott et al. (2012) who only report on a 2 ka section of the Holocene which covers a much longer interval.

P 4327, line 3: The authors suggest that the marine sequence helps to unravel climatic signals at regional scale, and such signals are obscured by local effects in terrestrial sequences. It is therefore ironical that, in order to help explain the marine pollen sequence, they rely on terrestrial surface pollen samples from the semi-desert, in which they themselves acknowledge their samples are biased by local wetness.

P 4330, line 4: Mucina et al. is from 2006 not 2007. Line 28 and 29: Pollen of Stoebe and Tarchonanthus are quite distinct and easy to recognize.

P 4333, line 16: The same argument for excluding Cyperaceae can be used to exclude grass pollen percentages, which was included, but derived from wet areas. Grass percentages in the modern samples from the wet spots are anomalous in relation to the wider dry surroundings, because wet spots attract grasses. Some local grass pollen, e.g., Phragmitis or cereals, may be distinguished by means of their sizes but these distinctions were apparently not made.

P 4335, line 3: The high grass percentage in Fy22 may be due to the local wetness of the Typha swamp (Table 1 in the supplementary information). This may help to explain the anomaly.

P4336, line 11: The surprising aspect of the surface samples, is that there is no Aizoaceae type pollen (including Mesembryanthemaceae). Yet the sampling transect

goes right through the Succulent Karoo Biome where these families and this pollen type should be most abundant to dominant. Other studies, e.g., Scott and Cooremans (1992) recorded high concentrations of them in the study region and also in spring deposits at Eksteenfontein in hyrax dung in the Kuiseb River (Scott et al., 1995, 1996). Another important paper that could be consulted is Coetzee, 1976), which describes modern Atlantic Ocean river-mouth samples. This should be an important reference for any marine pollen study in Southern Africa and could have been considered, e.g., on P 4339, line 18.

P 4337, line 18: It is not surprising that grass pollen is very prominent in the Namib but only during seasons with rain. The desert has dense grass cover soon after rain. Line 26: Grazing should reduce grass cover not increase it.

P 4338, line 14: The problem with Poaceae could be the same here as mentioned for Cyperaceae as discussed above for P 4333.

P4341, line 28: To say that when the Poaceae pollen increases it indicates Nama Karoo expansion seems wrong considering other modern pollen studies in the region. It is generally thought that prominent Asteraceae pollen a characteristic in spectra from this biome as suggested by previous work (van Zinderen Bakker, 1957; Coetzee, 1976; Coetzee 1976; Van Zinderen Bakker and Muller, 1987; Cooremans, 1989; Scott and Cooremans 1992). This is also relevant in descriptions of modern samples ca. P 4330. At least the authors should refer to these previous studies and explain why they think these differences occur. Again, the high proportion of Poaceae might simply be a local anomaly of the wet sampling spots where the modern samples were taken and it is not representative of the generally drier karroid vegetation. Higher Poaceae percentages in the marine core could indicate more rain in the adjacent desert but Poaceae pollen numbers in a marine core from 200 km offshore cannot shed any light on whether the boundaries of the Nama Karoo or Savanna Biomes changed.

P 4343, line 16: Why is the distinction between Fn-LSav and Bd-LSav relevant in these

pollen assemblages from a marine core, which is very far away from these two types of savanna, and in which there can hardly be any direct evidence of changes in either of them?

P 4344, line 1: It is very speculative to say that Bd-LSav retreated based only on Poaceae from a single marine core very far away. At least such a conclusion can only be made on the basis of a number of cores transecting some distance of ocean floor and where indicator tree species from the savanna types can be traced. This is not possible on the basis of grasses, which grow everywhere. We cannot be sure which pollen grains (including grasses and other types) come from the broad-leaved savanna or other adjacent vegetation types. Further why can high Poaceae in MIS 5 not simply be indicating more rain in the Namib Desert? We regularly experience dense grass cover in the driest part of the Namib after occasional good rains while savanna trees remain in the same place.

P 4358, Fig. 3: About Artemisia and Stoebe types, why are there no Artemisia type in the eastern Free State and no Stoebe type in Lesotho when these forms are recorded to be prominent in these areas (Scott, 1982 and Scott, 1989)? In connection with Restionaceae, there are none of them growing in Namibia according to the herbarium in Windhoek. How is it possible that their pollen grains are so numerous in Southern Namibia? The distribution of Chenopodiaceae-Amaranthaceae in two separated areas seems to be suspect as these plants grow all over southern Africa.

P 4363, Fig. 6: This diagram is confusing. It is not indicated what the grey area or the red arrows mean. In (a) there seems to an austral winter position for ITCZ and austral summer position for the westerly system in the same diagram and in (b) there seems to be an austral summer position for ITCZ and an austral winter position for the westerly system in the same diagram. The logic behind this picture must be explained better.

To summarize, I feel that (1) the marine pollen sequence holds some important information about palaeoenvironments for south-western part of Africa but that (2) its

interpretation in this paper does not make a reliable contribution. (3) The paper requires major revision with a completely different approach to interpret the meaning of the pollen sequence. (4) It should preferably not be based on the modern surface pollen data presented here without excluding Poaceae or dealing with apparent flaws like the lack of Aizoaceae/Mesembryanthemaceae pollen, etc.

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