

Interactive comment on ““Everything is scorched by the burning sun”: Missionary perspectives and experiences of 19th and early 20th century droughts in semi-arid central Namibia” by S. Grab and T. Zumthurm

S. Grab and T. Zumthurm

stefan.grab@wits.ac.za

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Anonymous Referee #1 Received and published: 15 October 2019 Overall: This is a decent study that outlines the impact of major droughts in Namibia during the 19th and early 20th centuries. Usually I would think that a paper of this sort was an unusual one for CP, but it seems that it is intended for the forthcoming special issue on droughts, where I think it will be a good fit.

YES, THE PAPER IS FRAMED TO SUITE THE SPECIAL ISSUE ON HISTORICAL

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DROUGHTS AND HAVING SEEN SEVERAL OF THE OTHER SUBMISISSONS MADE WE FEEL THAT OUR PAPER IS VERY MUCH SUITABLE TO THIS SPECIAL ISSUE AND IS PARTICULARLY VALUABLE GIVEN THAT IT IS THE ONLY CONTRIBUTION TO AFRICA AND ALSO REPRESENTS A CONTRIBUTION CONCERNING DROUGHTS FROM A SEMI-ARID REGIONS AND THUS ADD NEW PERSPECTIVES ON DROUGHT.

The paper shows good potential, but needs a bit of work to get it up to scratch. In particular I have the following general comments: The paper lacks a firm justification for what exactly a historical lens can bring. At the moment the justification is short, and somewhat contradictory. Adamson et al. (2018) in Global Environmental Change is helpful here, as well as similar work on southern Africa by Kelso and Vogel (2015) also in GEC and Hannaford's recent papers in Global and Planetary Change and WIREs Climate Change .

YES, THIS POINT IS WELL TAKEN. WE HAVE REMOVED THE TEXT 'HISTORICAL LENS' AS IT CREATED CONFUSION WHAT THIS MIGHT BE. WE HAVE EXPANDED THE TEXT IN TWO PARTS OF THE INTRODUCTION TO ADDRESS THESE CONCERNS. IN PARTICULAR, WE HAVE NOW EXPANDED THE LAST SECTION OF THE INTRODUCTION TO MAKE IT MUCH CLEARER AS TO WHAT EXACTLY THIS PAPER AIMS TO DO. For this reason, there is value in exploring drought contexts through a window of time when the natural-human environment was rapidly transformed into a more human-engineered environment (through colonial conquests). For instance, it may provide insight to how drought impacted past indigenous populations and the environment, in ways that may no longer apply today, such as water-resource contexts during periods of nomadic lifestyles. AND This then provides us with an opportunity to establish similarities and differences in 19th C drought-related circumstances and experiences through dryland regions of southern Africa. More particularly, we aim to:1) outline the historic context of meteorological/hydrological drought over central Namibia, 2) provide evidence for the (at times) relatively complex geographic na-

ture (spatial/temporal) of such droughts in the region, 3) summarize central Namibian drought events between 1850 and 1920, and 4) establish the temporal shifts of influence and impact that historical droughts had on society and the environment during this period, as portrayed in written documents.

There is some confusion over the use of the word 'drought'. This is partly due to the use of the term drought in Grab and Zumthurm (2018) (which I would drop in favour of 'very dry'). The terms 'regional drought' and 'major drought' are also used without being explained, and I would like to see a little more description of which type of drought they are referring to at various places (agricultural, socioeconomic, ecological etc).

TO US, THIS IS A VERY INTERESTING COMMENT AND ONE WE HAVE REFLECTED ON CONSIDERABLY. WE ENSURE TO EXPLAIN MORE PRECISELY THAT WHAT WE ARE DEALING WITH ARE HYDRO/METEOROLOGICAL DROUGHTS. WE HAVE ALSO ELABORATED ON THIS MATTER IN THE INTERACTIVE DISCUSSION. I HEREBY ATTACH THE COMMENTS IN ITALICS: Dear Anonymous Reviewer I really value your comments. One that in particular struck me is the questioning about differentiating between 'regional drought' and 'major drought' given that these have not been adequately defined. In reflecting on this, I think drought terminology needs more careful consideration in documentary based climate work. I have just had a look through several prominent documentary based climate reconstruction papers (and some already published in this special volume on droughts) and many, if not most, use drought terms rather vaguely. The irony is that the discipline has been generally good in classifying - through defining attributes - different categories of wetness or dryness, but when it comes to 'drought' - we have generally failed in this regard. So, papers have used terms such as 'drought', 'moderate drought' and 'severe drought' all in the same paper without any differentiation between these categories of drought. Other papers have used terms such as 'major drought', 'extreme drought', 'very great drought', 'extraordinary drought' etc...all without any clarification how these might differ from a 'normal' drought. The work by Tejedor et al and Brazdil et al (both this volume)

- are exceptions to this as they quantify and explain, respectively, what constitutes an 'extreme drought'. Most other papers have failed to do so - including our own here – so thanks for highlighting this to us. Defining the category of drought I guess depends on ones frame of reference and geographic work space etc - so what might be a 'severe' drought to one region may only qualify as a 'moderate' one to another, or may in fact not even qualify as a drought if in a much drier region. So collectively we have much to improve on defining categories of drought in terms of their severity, extent, duration etc. I will make sure we cover ourselves better in this regard when revising the current paper. Many thanks again for this interesting and important point. Stefan

WE WOULD, HOWEVER, DISAGREE WITH THE REVIEWER'S SUGGESTION THAT WE CHANGE THE TERM 'DROUGHT' TO 'VERY DRY' BECAUSE ALL 'VERY DRY' SITUATIONS DISCUSSED ARE IN OUR OPINION SYNONYMOUS TO 'DROUGHT' AND ALL YEARS CLASSIFIED AS 'VERY DRY' ARE IN DROUGHT. ALSO, WE PREFER TO USE THE TERM 'DROUGHT' TO THE TERM 'VERY DRY' BECAUSE IT COMPLIES WITH THE LITERATURE ON DROUGHT. IF WE WERE TO CHANGE WHAT REALLY IS A 'DROUGHT' TO RE-DEFINING IT AS 'VERY DRY', THEN THIS WOULD NO LONGER COMPLY WITH THE LITERATURE AND ALSO NO LONGER COMPLY WITH ANY OF THE OTHER PAPERS IN THIS SPECIAL ISSUE AS THE TERMINOLOGY WOULD DIFFER. WE DO, HOWEVER, MAKE IT VERY CLEAR FROM THE START WHAT WE UNDERSTAND DROUGHT TO BE FOR OUR PAPER – HERE IS AN EXTRACT OF OUR REVISED INTRODUCTION: In this special issue, Brázdil et al. (2019) explore various types and characteristics of drought that are relevant to both contemporary and historical contexts. These authors use the definition by Wilhite and Pulwarty (2018) to define drought as 'a prolonged period of negative deviation in water balance compared to the climatological norm in a given area' (p1915). Although quantification of 'climatological norms' during pre-instrumental periods is challenging, if at all possible, we broadly follow Wilhite and Pulwarty's definition of drought for our current work.

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The discussion doesn't compare with any of the other similar studies that have been done in the region. In particular, Kelso and Vogel's work would make a very interesting comparison in terms of impacts, and Endfield and Nash's work in terms of the way that missionaries recorded drought.

ALTHOUGH WE WERE FAMILIAR WITH THESE PAPERS, WE HAVE NOW READ ALL THESE PAPERS AGAIN TO ADDRESS THIS CONCERN. ON HAVING READ THEM AGAIN, WE REALIZE JUST HOW DIFFERENT (AND IN OUR VIEW WE BELIEVE 'UNIQUE') OUR PAPER IS, IN TERMS OF WHAT IT PRESENTS CONCERNING HISTORICAL DROUGHTS IN SOUTHERN AFRICA. OUR PAPER DEMONSTRATES SOME IDENTIFIED TEMPORAL CONSEQUENTIAL AND HUMAN RESPONSIVE PATTERNS TO DROUGHT, WHICH NONE OF THESE OTHER PAPERS ADDRESS. ALTHOUGH ALL THE WORK FROM THESE OTHER REGIONS IS EXCEPTIONALLY INTERESTING AND VALUABLE TO US, THESE OTHER PUBLISHED WORKS ARE NOT DIRECTLY COMPARABLE TO WHAT WE PRESENT. IN FACT IT IS DIFFICULT TO MAKE ANY STRONG COMPARISONS WITH OUR PAPER BECAUSE THE WAY THESE OTHER PAPERS ARE THEORETICALLY FRAMED - ALL RATHER DIFFERENT TO THE WAY OUR PAPER IS FRAMED. HOWEVER, WE HAVE LOOKED VERY CAREFULLY WHERE WE MIGHT BE ABLE TO CITE THESE PAPERS WHERE THERE IS SOME RELEVANCE TO WHAT WE DISCUSS. THE STRONGEST LINKS WE FOUND WERE IN THE KELSO AND VOGEL (2015) WORK WHERE THESE AUTHORS ADDRESS DROUGHT AND RESILIENCE THROUGH THE 19THC IN NAMAQUALAND AND WHERE WE ARE INDEED ABLE TO MAKE SOME RELEVANT LINKS – WHICH WILL NOW BE MADE AS WE REVISE THE MANUSCRIPT. BUT EVEN HERE, MANY OF THE THINGS WE DISCUSS CONCERNING WATER AND THE ENVIRONMENT ETC ARE NOT DISCUSSION POINTS FOR NAMAQUALAND AND OTHER SUB-REGIONS OF SOUTHERN AFRICA (I.E. KALAHARI ETC).

Specific comments are below: Abstract: spelling of achieved? NOTED

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Lines 35-47 – the justification needs strengthening. It seems to suggest that the conditions under which ecological drought occur now are different to any in the past; i.e. they are related not to rainfall deficiencies (because of engineering) but to population growth. If this is the case, what exactly can historical case studies contribute? (To be clear I'm not saying they have no contribution to make – just that a better justification is required.) THIS HAS NOW BEEN ELABORATED

Line 129-130 – where do these terms come from (climatic, consequential, social responsive, environmental) and what exactly do they mean? THIS HAS BEEN RE-WORKED NOW

Line 183-208 – the point is well taken, but how did you deal with it? Did you, for example, ignore any mention of the word 'drought' that came from missionaries who had been in country for less than three years? (This comes up again later.) WE EXPLAIN THAT THIS IS NOT A CONCERN GIVEN TRIANGULATION OF SOURCE INFORMATION AND CAREFUL SCRUTINY OF SUPPORTIVE EVIDENCE

Section 3.2 – This section feels like it should come after section 3.3. YES, HAVE CHANGED THIS AS REQUESTED

Line 221 – I assume the terms 'sufficient' and 'relatively wet' come from Grab and Zumthurm (2018)? If so I would suggest reproducing the key figure(s) from this paper. OK, WE CAN INCLUDE ANOTHER FIGURE TO COVER FOR THIS

Line 222 – This term 'regional drought' needs more explanation. Is there a corresponding 'local' or 'widespread' drought? How does a regional drought relate to a 'major' drought, given later? YES, WE CAN ADDRESS THESE TERMINOLOGICAL CONCERNS ACCORDINGLY AND IN FACT REMOVE THESE SUB-CATEGORIES OF DROUGHT TO AVOID SUCH CONCERNS.

Lines 259-262 – A few things here. Firstly, the authors need to be clearer on what they mean by 'major drought'. Secondly, more detail is needed on how very dry years were

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assigned in Grab and Zumthrum (2018), and I would include at least one figure from this paper (see above). I would also stick with the term ‘very dry’ and drop ‘(drought)’ as this is a little confusing and confounds the meteorological droughts assigned by the rainfall reconstruction with the other types of drought (agricultural, socioeconomic, ecological) of interest in this paper. YES, THESE CONCERNS ARE SIMILAR TO THOSE ADDRESSED ABOVE AND TO WHICH WE HAVE RESPONDED ABOVE. BUT YES, WE WILL ADDRESS THE TERMINOLOGY ISSUES AND ADD THAT EXTRA FIGURE.

Line 262-265 – Is it suitable to just count the number of references to drought, given the issue with new missionaries into the area that were previously mentioned? I wonder if the authors should remove all mentions of the word from those who have been in the country for three years or less, given that this period is the length of time they suggest it was taking a missionary to understand what normal conditions were. WE WILL ELABORATE WHAT WE INTEND TO ACHIEVE WITH THIS FIGURE IN THE FIGURE CAPTION. THE FIGURE IS NOT INTENDED TO INFORM WHEN THE DROUGHTS OCCURRED BECAUSE OUR IDENTIFICATION OF PERIODS OF DROUGHT IS NOT BASED ON NUMBER OF MENTIONS OF DROUGHT AT ALL. IN FACT WE WISH TO SHOW JUST THE OPPOSITE, NAMELY THAT WHEN WE HAD PERIODS OF IDENTIFIED DROUGHT, THERE WAS MUCH MORE WRITTEN ABOUT DROUGHT IN VARIOUS DOCUMENTS AND SO THE FIGURE SERVES TO SHOW JUST HOW OFTEN DROUGHT IS MENTIONED BY YEAR. ...AND IN FACT IT IS MENTIONED IN SOME YEARS WHEN WE DO NOT ACTUALLY HAVE A DROUGHT. BUT WE WILL EXPLAIN THIS BETTER IN THE TEXT.

Section 3.4 – On the whole there could be a lot more information given about these droughts, if the word count allows WE DID NOT WISH TO ELABORATE FURTHER ON THESE DROUGHTS BECAUSE OTHER DETAILS ABOUT THE SAME DROUGHT ARE ALREADY ELABORATED ON IN GRAB & ZUMTHURM (2018). IT WOULD NOT BE ETHICAL FOR US TO DUPLICATE THAT WHICH HAS ALREADY BEEN

PUBLISHED AND SO WE WERE VERY CAREFULL TO JUST PROVIDE A SUMMARY OF THE DROUGHTS AND ASPECTS OF THE DROUGHTS THAT HAVE NOT BEEN METIONED IN THE PREVIOUS PAPER OF OURS. HOWEVER, WE AGREE THAT THE SECTION COULD BE EXPANDED AND GAVE THIS SOME FURTHER THOUGHT AS TO WHAT MIGHT BE MOST APPROPRIATE HERE. WE FEEL THAT THE BEST WAY TO EXPAND THE SECTION MAY BE TO COMAPRE OUR CENTRAL NAMIBIA DROUGHT PERIODS WITH CONDITIONS OVER THE ADJOINING KALAHARI AND NAMAQUA REGIONS. THIS WOULD ALSO THEN ADDERSS SOME EARLIER CONCERNS THAT WORK DONE IN THESE ADJOINING REGIONS DESERVE A BIT MORE REFERENCE.

Section 4 – In general this is fine, but there is no comparison with any other studies. How does what was happening in Namibia compare with neighbouring regions? Kelso and Vogel's work on Namaqualand is particularly important here, as well as Endfield and Nash's work on the Kalahari. WHERE RELEVANT, WE NOW MAKE REFERENCE TO SUCH WORK.

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