

## ***Interactive comment on “Drivers of spatial and temporal variability of streamflow in the Incomati River Basin” by A. M. L. Saraiva Okello et al.***

**Anonymous Referee #2**

Received and published: 19 September 2014

The MS tries to identify and discuss drivers of spatial and temporal variability of stream flow in the Incomati - a trans-boundary basin shared between South Africa, Mozambique and Swaziland. The MS uses statistical analyses and IHA approach based on long term rainfall and stream flow records respectively to achieve this. The methods used are standard and straight forward but have not been used in this basin.

This is an interesting area of study whose results could be used to improve management of the shared water resources.

One of the biggest issues with this MS is that it is rather verbose and in some places poorly written. The use of the comma particularly needs to be improved throughout the MS.

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The authors seem confused about what exactly their paper is about. The link between the title of the MS and the goal of the paper (Page 8882, Line 19) needs to be made stronger. Either a rewording of the title or a rephrasing of the goal is necessary so that the two are closely aligned.

1. Introduction: Page 8881 Line 14 – what are these data that are scarce. There is need to qualify this. Page 8882 Line 5 – delete ‘dramatic’ Page 8882 Line 20 – delete ‘dynamics’ Page 8882 Line 27-28 – this is not specific and therefore does not do anything to improve the MS at this introduction stage. The last part of the sentence from ‘... as well as .....conducted in the area.’ could be deleted without affecting the MS.

2. Methodology Page 8883 Line 14 – Since the MS is quite detailed about where the mouth of the river is, one would be expected to be specific about where the river’s source is rather than just saying ‘in the west of the basin.’ Surely it is not difficult to get this information. Page 8883 Line 21 – high escarpment not high-lying escarpment Page 8884 Line 7 – rewrite the statement to read; ‘the geology is complex, characterised by.....’ Page 8885 Line 5 – rewrite to read; ‘Annual, monthly and daily data for southern .....’ Page 8885 Line 10-14 – Sentence is difficult to read. Rephrase Page 8885 Line 14 – It is meaningless to say ‘good observed data’. What is ‘good’? How is it measured? Good for what or for whom? Page 8885 Line 15-16 – Poor expression. Rephrase Page 8885 Line 19 – there is need to briefly explain why two intersecting periods were chosen. This is for readers who may not be familiar with the method. Page 8885 Line 21 - change to ‘The test determines the timing of a change in a time series.....’ Page 8885 Line 21-25 – this is does not read well and is therefore difficult to follow. Rephrase.

Section 2.2.1 – there is generally no adequate description of the techniques and no attempt is made to justify the choice of these methods.

Page 8886 Line 8 – How is the ‘quality’ of the data defined? There is nowhere else in

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the MS that this data 'quality' issue is discussed, so it would need to be qualified here. See my comment on 'good' data. Page 8886 Line 11 – change to '...very few stations could be considered not impacted by human interventions.' Why is it necessary to use data from stations that are 'least' impacted by humans? There is no justification or explanation for this. Page 8886 Line 13 – delete 'and summarized'

Section 2.2.2 – are there no stations in Swaziland? This needs to be explained.

Section 2.2.3 – the whole section is poorly written and needs to be rewritten. The MS does not adequately and clearly explain the IHA method. Some mistakes are pointed below: Page 8887 Line 1-3 – I can hardly follow what the authors are trying to say. Page 8887 Line 7 – what does 'water conditions' mean? Page 8887 line 10 – which flow metrics are these? Page 8887 Line 11 – does the software only analyse 'linear' trends? Why not just say 'trends'? Whether or not these are linear is immaterial, I presume. Page 8887 Line 12-13 – this trend is evaluated with the P value. . . . . What is the p value? What does it represent? What is the range of values for P? Why choose  $P \leq 0.05$ ? The explanation and/or justification for method are missing. Page 8887 Line 20-24 – this should be made more concise.

3. Results Page 8888 Line 6-7 – '...due to the elevation gradient.' Firstly, change to '... as a result of elevation' if you want to use this. Secondly, is this the reason for variability? How was this determined? Sounds like guessing to me. Page 8888 Line 23 – delete 'of an increase or decrease', it is not necessary. Page 8889 Line 18 – '...buffered due to flow regulation. . . .' The use of the phrase 'due to' is wrong. What the authors want to say that it is a consequence of; then they could use 'as a result of' instead. The flow regulation issue is very important and needs to be discussed more. Page 8890 Line 1-4 – This explanation does not sound correct to explain the observed trend. Page 8890 Line 8-10 – the concept of reversals is really interesting. It needs to be properly explained in the text. Page 8890 Line 14-15 – What does 'cross-compensate' mean? How is this compensation achieved? What is the effect of this? No change at all? If there is any other effect observed, how would one confidently talk

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about cross-compensation? How would it definitively be determined? Maybe it's the wrong phrase used here? Page 8890 Line 27-next page – The statement needs to be rephrased as it is difficult to follow. Page 8891 Line 15-22 – It is inadequate to use only one rainfall station to explain the change in stream flow, as a stream flow gauge represents a summation over a catchment area, at times quite big (in this case 126 km<sup>2</sup>). So using one rain gauge, no matter how close to the flow station, does not make sense and is not informative enough. Therefore it is not possible to conclude that the flow reduction is a result of land use change. While it is probable that land use change is the driver here, this cannot be explained by that one rain gauge. Page 8892 Line 16 – who is 'they'? Ridell et al? Then write Ridell et al! Page 8892 Line 18 – What is 'homogenisation of the flow regime'?

4. Discussion Page 8894 Line 3-6 – this issue of problems with data on high flows in the time series was never raised earlier. What is the explanation/discussion for the analysis being uncertain? How? What is the impact? This is a discussion section; one would expect some 'discussion' to take place! In what way would the developments affect the analysis? What can be done? How about naturalisation of flows? Page 8894 Line 16-18 – It sounds like this was not a problem. So why is this reported as a limitation? Page 8895 Line 16 – the concept of 'reverse seasonality' would need to be explained/discussed more clearly. Page 8895 Line 21-22 – This does not read well. Rephrase. Page 8895 Line 25-26 – Did the climate change during this period? Page 8896 Line 9-11 – Rephrase. Page 8896 Line 19-21 – A good point raised that needs to be explained clearly. Page 8896 Line 28 – What does 'this' refer to in 'This is even more. . . .'? Page 8897 Line 5-8 – this is a big challenge and expensive. Perhaps the MS should give pointers as to how this can be achieved.

5. Conclusions Page 8897 Line 10-11 – What does this introductory statement mean? It is not clear. Rephrase Page 8897 Line 19-21 – rephrase statement Page 8898 Line 7-8 – It's the Water research Commission

6. Tables Table 1 – What are 'first priority supplies.' These are not available in the text

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Table 6 – Explanation of CD is missing on the table, though its available in the text

7. Figures Figure 2 – the figures are too small and difficult to read. Also both show the same information, choose one. Figure 4 – the scale of rainfall anomalies is too large and therefore masks the changes. I advise that the graphs be separated.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 8879, 2014.