

## ***Interactive comment on “Evaluating the influence of long term historical climate change on catchment hydrology – using drought and flood indices” by I. B. Karlsson et al.***

**Anonymous Referee #1**

Received and published: 22 April 2013

### *1) General comments :*

The manuscript present a relevant study based on a 133 year hydrometeorological (1875-2007) serie of the 1055 km<sup>2</sup> Skjern river catchment in western Denmark. A detailed trend analysis on meteorological and discharge data (available only for the period 1920-2007) is conducted. The analysis on observed data is completed by a model-based analysis using a simple lumped hydrological model. With the series and the model, the authors reach some substantial conclusions on observed trends, simulated water balance, the ability of the model to reproduce the current trends and the ability of the model to evaluate the impact of climatic changes over the catchment. They

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also discuss the link with climate change over the basin and NAO, SCA and AMO.

This paper is potentially very reach, however some points or part need to be improved as they are not supported by enough evidence, or some important points are still missing. The paper is relatively long and some of the important data and results are scattered over all the paper. I suggest to give strengthen the paper by adopting a clearer structure and improve the scientific quality of the demonstration. I'll develop below the main points that need to be improved.

Observed data:

The authors did not mentioned how the quality control of the data was done, in particular if the data have been previously homogenized (i.e. corrected from any ruptures in the serie due to instrumental change, relocation of the stations, ...). This practice is common and mandatory in the analysis of climate trends. Note the Mann-Kendal is not sensitive to rupture (as a rupture affect only one element of the serie), however, a rupture has an influence of the value of the trend. Hence, the use of non-homogenized data can lead to large errors in trends and the authors should be careful about this point.

ETP:

The Thornthwaite ETP is a rather crude estimate of the ETP which is based only on temperature. The Penman-Monteith estimate is of better quality but need more data, this is the reason why it has been used only for the period 1990-2009. The correlations shown in Table 1 are rather low (e.g. For June, only 49

Non stationarity of the basin, and general treatment of the uncertainties :

In a general manner, the authors do not take enough into account the uncertainties. Some are discussed (e.g. in §5.2.2), a balanced treatment is needed (e.g. taking into account ETP). The non stationarity of the basin is discussed in several paragraphs (e.g. 2.1), but not in a coherent manner with the other sources. One of the best way

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to improve this point point would be to reorganize the manuscript in order to treat the uncertainties issues in a coherent way and provide some kind of error bars to results.

Link with climate:

I must say that this part of the manuscript (part 7 and 8) is not really convincing. Most of the arguments are not supported by enough material. I given only the example of §8.2 which should be deleted or significantly improved. The discussion on NAO and climate drivers are rather confuse, and at the end the reader has difficulties to make it own opinion.

*2) Specific comments:*

The title is is not very specific and could be changed to more reflect the content of the paper (i.e mentioning the catchment, what are the "changes")

Page 2375, lines 10-14: please be more specific

Page 2376, line 11: please explain the threshold method

Page 2376, line 14: please, explain what is your definition of "shortÂäperiod"

Page 2377, line 6: a presentation of the outline of the paper is lacking at the end of the introduction

Page 2378, line 14: the time period investigated in the study is not defined at this stage of the paper

Page 2387, line 16: "spacial" is misspelled

Page 2389, lines 1-6: this paragraph is not clear

Page 2404, lines 6-12: this paragraph is really unclear

Page 2406, line 9: The authors might consider refereeing to Stahl et al. (2010), Streamflow trends in Europe: evidence from a dataset of near-natural catchments, HESS.

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Tables and Figures: the Tables and Figures are clear, but the legend should be more precise, in order to avoid to systematically refer to the text to understand it.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 2373, 2013.

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