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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "Stage level, volume, and time-frequency information content of Lake Tana using stochastic and wavelet analysis methods" *by* Y. Chebud and A. Melesse

**Anonymous Referee #2**

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General comments: The paper comes along with a very interesting analysis of the water level fluctuations of Lake Tana in Ethiopia. It aims at a better understanding of extended drought periods which have been observed repeatedly and could not be reconstructed by water balance approaches. Given the uncertainties and failures of deterministic models, alternative ways of predicting Lake Tana water level fluctuations are required. To that end, different stochastic approaches were applied. Comprehension of the paper is substantially complicated by the poor quality of the English text. The paper needs substantial reworking with respect both to presentation of the results and for language editing.

Specific comments:

1. According to paragraph 5.2, the wavelet analysis served two different purposes. One of these was investigating the effect of temporal resolution of the data on. However, that objective should be announced in paragraph 3.2. The second objective was to check for constancy of the spectral properties of the time series. However, most of the spectral power belongs to the low-frequency range with period lengths that exceed the length of the available time series by far (Fig. 6). This part of the spectrum can hardly be interpreted. The inferences given at page 5537, line 16-18 are hardly supported by Fig. 6. Moreover, Fig. 6 as well as the results by Chebud and Melesse (2009) (p.5531, l. 20-22) seem to be at odds with p. 5536, l. 27-28.

2. The null hypothesis of the Kolmogorov-Smirnov test is a Gaussian distribution of the data. An error probability of less than 0.01 (p. 5535, l. 5-7) implies that the hypothesis of Gaussian distribution is rejected rather than being confirmed. However, it is well known that hardly any real-world data set would pass the Kolmogorov-Smirnov test when the sample size exceeds a few hundred data points. Has the Lilliefors correction been used for the Kolmogorov-Smirnov test?

3. P. 5535, l. 11-17: The autocorrelation analysis can give some hints on periodicities in the data set, but it is not a rigid test. It should only be interpreted with respect to the temporal correlation length, that is, the memory of the system.

4. In the copy I got, the figures are too small, of poor quality and different lines can hardly be distinguished.

5. Fig. 3: Obviously a spline function is used for the plotted line. That should be avoided because it suggests a continuous function rather than discrete points.

6. Fig. 4a+b: As far as I got it, measured data of annual mean lake water level are not included in these figures. Please add.

7. Fig. 5: I could not discern any differences between the blue and pink time series.

That might be due to the poor quality of the figure. If not, I recommend to give, e.g., the Pearson correlation coefficient instead.

8. Results of the study should be discussed more extensively with the literature. Half of the given references are textbooks or technical papers rather than referring to corresponding studies.

Technical corrections:

1. P. 5529, l. 13: Should be Q(t) (L3/T)

2. P. 5529, l. 14-16: The small sketch ("free diagram") should be discarded.

3. Paragraph 5.2 and Fig. 5: What does the vertical meter bar indicate in that figure? There is a substantial inconsistency using "Cs/s" (in the figure caption), "cs/s" (in the figure) or "s/cs" (axis label in the figure). Why do you divide the reconstructed signal by the original signal (or vice versa)? At the x-axis, years should be given instead of days.

4. It should be "Kolmogorov-Smirnov test" instead of "Konglomorov-Simrnov test"

5. Fig. 5: Figure titles should be discarded, because they are redundant to the figure caption.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5525, 2010.