

Interactive comment on “Rain event properties and dimensionless rain event hyetographs at the source of the Blue Nile River” by A. T. Haile et al.

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Response to reviewer's comments on: “Rain event properties and dimensionless rain event hyetographs at the source of the Blue Nile River” by A. T. Haile et al.

Anonymous Referee #2

In the presented study, the authors performed several statistical analyses toward the precipitation data they gathered in the Gilgel Abbay watershed in Ethiopia. By separating the rainfall records into various events, the statistics of depth, duration, mean intensity, peak intensity, and inter-event time of all events are reported. The dimensionless event hyetographs are also derived based on the data they collected.

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Major Concerns Reviewer's comment: Since the gauge observation is relatively scarce in the study area, the statistics provided in this paper seem to be valuable for Ethiopia. However, the data length is too limited to support the analysis of rainfall events. It should be noted that the authors selected a very low (30-minute) minimum inter-event time (MIT) criterion to separate their rainfall events, while 6_8 hour MIT were generally adopted in the previous studies. Therefore, if making such an adjustment, the amount of rainfall events could be dramatically lowered to support a meaningful analysis. Of course, the selection of MIT is somewhat subjective, mainly depending on the purpose of study. From the hydrologic point of view, one would be more interested to study the behavior of observed rainfall events that can be used in the surface water modeling. Hence, 6_8 hour MIT is more reasonable since it provides sufficient time to generate the surface runoff. If MIT is too small, the rainfall observation should be classified into a single event since they would likely contribute to the same flood peak.

Response: We partly agree with the reviewer. Indeed, results on records of 30 min time periods may lead to bias and conclusions may be subjective but, presumably, such holds for any selected inter event time. By absence of high-resolution data in many regions of the less developed world, many applications in erosion studies, event based runoff modeling, rainfall disaggregation studies and flood studies may benefit from (a better) understanding of event properties even if analysis are based on a relatively short period of continuously recorded data. This particularly holds when the spatial scales of applications are considered where applications on smaller spatial scales commonly rely on rainfall data available at higher temporal resolution. In addition and when considering the convective nature of the rain events and their short duration in the basin (~ 1-hour), we believe that using a small MIT will better represent or reflect effects of rainless gaps on derived event properties in the study area. To address hydrologic relevance and following the reviewer's suggestion additional results (Figures 7 and 8) are presented to indicate how results change when MIT= 30 min. is increased to 8 h as suggested by the reviewer. Reviewer's comment: It is also very disappointing to see that the authors tried to make a case based on insufficient data (ten stations

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with two years of data from 2007 to 2008), neglecting the fact that the annual variability of rainfall is typically very large. Therefore, the scientific insights provided in this study could be biased, even though the procedures and methods are appropriate. Furthermore, the authors should also address what the major and different contribution of this paper provides comparing to their prior publication (Haile et al., 2009). In my personal opinion, the fundamental information of observed precipitation has been addressed sufficiently in Haile et al. (2009), so the regional data scarcity should not be used as a major contribution again in this paper.

Response: (i) The reviewer also states that time series are too limited to support analysis of rain event properties. We agree that preferably longer time series should be used but after comparing observed data to long term climatologic data we could not find any indication that observation data were of an extreme or inconsistent nature. We compared the seasonal rainfall of the two seasons against long term climatologic rainfall and reported the results in the last paragraph of Section 1. It is shown that the rainfall amount in these two seasons is not largely different from climatologic mean rainfall. It should be noted that rain event properties of most tropical areas has not been well studied due to absence of data. Further we note that many studies are reported that use relatively short time records and we cited some of these studies in the manuscript. (ii) Haile et al. (2009) reported only on the diurnal cycle of rainfall depth and frequency in the region. The authors did not report on how rain event properties vary in space-and time. As stated in the sixth paragraph of Section 1, this study significantly differs from Haile et al. (2009) and contributes to our understanding of rain event properties that are rain event depth, rain rate, duration, intensity and inter-event time. Although there are numerous studies that address variability of rainfall depth at daily and annual scale we would like to note that event properties such as duration, intensity and inter-event time have not been well explored in literature for, in particular, less developed countries. Actually, despite the wide range of articles available on our study area, the issue of rainfall event properties still has been ignored and commonly only daily observations are used.

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Reviewer's comment: The usage of "conditional probability" in Section 3.3 is unclear and ambiguous. I.e., conditional probability of what? In addition, from Eq. (9), P_{ij} should be always equal to P_{ji} . The authors should check if the formulation of Eq. (9) is what they want.

Response: Following the comment by reviewer 1, this section is removed from the current version of this article.

Other Minor Issues

Reviewer's comment: It seems that all table captions are misplaced by the figure captions in the version I received. It needs to be fixed as soon as possible. Response: We would like to thank the reviewer for the comment. This problem is fixed now.

Reviewer's comment: P5806, L25: Should it be Zeng et al., 1996?

Response: We are referring to Zeng et al., 2000 and fixed it in the Reference Section.

Reviewer's comment: P5808, L4: Bras (1979) is missing in the Reference section.

Response: Bras (1979) is not cited in the latest version of our manuscript since we removed a couple of sections based on reviewers' comments.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5805, 2010.

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