

Interactive comment on “Synchrony of trend shifts in Sahel summer rainfall and global oceanic evaporation, 1950–2012” by A. Diawara et al.

Anonymous Referee #1

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This paper described a multidecadal link of boreal summer rainfall over Sahel region with the global oceanic evaporation by using long-term observation and reanalysis data. The analysis of global climate fields suggested that a recent positive shift in the Sahel rainfall variability may be induced by the increased oceanic evaporation in both the Northern and Southern Hemisphere. The results shown here are interesting and the paper is well written, but a detailed mechanism behind the multidecadal link between the Sahel rainfall and the global oceanic evaporation is not clearly examined. Also, the relation between the global SST and LHT variability are not fully investigated in the relevant figures. These issues should be carefully addressed to improve our historical understanding of the multidecadal rainfall variability over Sahel region. Therefore, this paper requires major revision before possible publication. Below

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are the major and specific comments on this paper.

Major comments: 1. Multidecadal link between the Sahel rainfall and the global oceanic evaporation (Section 3.1) In the introduction section, the authors clearly stated that understanding the source of Sahel rainfall should help explaining the variation, but they did not perform any detailed analysis for the source of Sahel rainfall variability. Although the multidecadal link between the Sahel rainfall and the global oceanic evaporation was mainly discussed in this study, a detailed mechanism behind the source of Sahel rainfall variation is not well studied. Which part of global oceans plays a key role in the Sahel rainfall variation? How does the evaporation over the above ocean affect the Sahel rainfall variability? The authors should provide more detailed information on the source of Sahel rainfall variability.

2. Role of oceanic evaporation in the SST variability (Sections 3.2-3.4) The link between the SST and LHT variability is still unclear. The authors claimed that in the Northern Hemisphere, the positive shift in the SST variability induces the positive shift in the LHT variability. However, this is not evident in the zonal mean figure, where the SST variability north of 40° N clearly shows the negative shift (Fig. 4). Also, the authors mentioned that in the Southern Hemisphere, the positive shift in the wind variability contributes to the positive shift in the LHT variability. But, it is hard to see the positive shift in the wind variability, because the wind variability represents opposite signs north and south of 20° S (Fig. 6). Furthermore, the negative shift in the SST variability cannot be clearly seen north of 50° S. The authors should carefully describe regional differences in the multidecadal variability among the variables.

3. Data quality before the satellite era There is ample evidence that the observational data in the Southern Hemisphere before the satellite era are not so reliable as those in the Northern Hemisphere, but the authors elaborated on the multidecadal link with the Southern Hemisphere before the satellite era as well. The multidecadal link with the Southern Hemisphere should be focused in the recent satellite era. Rather than the Southern Hemisphere, the neighboring oceans such as the tropical Atlantic and North

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Atlantic Oceans would have a major role in the multidecadal rainfall variability because of proximity to Sahel region.

Minor comments: P11270 L1: “summer” should be “boreal summer”. L4-6: This argument is very strong and needs to be modified with further analysis. L7-9: Analysis of moisture flux would be helpful for identifying whether the anomalous moisture advects over the continent or not.

P11271 L21-24: Did the authors compare their results with other available rainfall data (e.g. GPCC)?

P11272 L17-25: The defined box does not cover major Sahel rainfall region. I do not understand why the authors used the box covering only half of the boreal summer rainfall peak, although the signature is not sensitive to the definition.

P11277 L4-6: This sentence seems to have nothing to do with the purpose of this study.

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