

## ***Interactive comment on “Analyzing precipitationsheds to understand the vulnerability of rainfall dependent regions” by P. W. Keys et al.***

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In this paper Keys et al. develop the new concept of precipitationsheds to demonstrate how upwind terrestrial evaporation source areas contribute moisture for precipitation in downwind sink regions. They delineated seven potential sink regions based on three different criteria, namely aridity index for dryland classification, areas with predominantly rainfed agriculture, and areas with more than 50% of the growing season precipitation comes from terrestrial sources. For these seven regions, they qualitatively assess the vulnerability of precipitation and identify risks and opportunities associated with potential land cover changes. The paper is well written and very interesting. To my opinion a few minor corrections are required. More details about the new concept should be given, and it should be discussed more critically. Please find attached my

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comments in more detail:

Comments in more detail:

- The threshold to delineate precipitationsheds of 70% seems to be arbitrarily to me. Please elaborate the reason for this choice. Is it based on an empirical study using different thresholds?
- As the concept of precipitationshed is new, it deserves its own paragraph.
- Please insert limitations and shortcomings of the applied Water Accounting Model (WAM) approach: The WAM uses specific humidity and wind speed ( $u, v$ ) to calculate the integrated moisture fluxes, and it comes up with one single value for the entire atmospheric column. To my feeling this is dangerous especially for regions where different flow directions exist in different height levels. As an example, the moisture flow in the West African domain near surface is either dominated by the northeasterly or the southwesterly trade winds depending on position of the ITCZ. It is overlain by the African Easterly Jet at 600-700 hPa, and the Tropical Easterly Jet at 200 hPa.
- As certainly beyond the scope of this paper, it should be at least critically mentioned that a validation of the identified precipitationsheds is still missing. Maybe a Lagrangian approach can be applied for this purpose.
- It would be very valuable to roughly estimate the uncertainties of the dataset and variables used for this study: which variables are reliable and solely influenced by measurements, which variables are purely modeled? A cross-validation using e.g. NCEP/NCAR reanalysis could be performed in a future study. Please elaborate and insert some comments on this issue.

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