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Hydrology and Earth System Sciences Discussions

Interactive comment on "Precipitation patterns and moisture fluxes in a sandy, tropical environment with a shallow water table" *by* M. R. Minihane and D. L. Freyberg

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Precipitation patterns and moisture fluxes in a sandy, tropical environment with a shallow water table Authors: M. R. Minihane and D. L. Freyberg

Author reply to open discussion reviews.

We appreciate the comments from the reviewers and the opportunity to use this feedback to improve the clarity and quality of the paper. In this response, we address each of the reviewers' comments directly and outline how we plan to change the manuscript accordingly.

There is one major change that affects multiple reviewer concerns. Specifically, we will better leverage the numerical model as a tool to understand vertical moisture fluxes through the vadose zone. We will use it to provide insight into fluxes that lead to recharge rather than just focusing on moisture content changes. This additional piece will provide a direct tie between moisture content changes and moisture fluxes, and will strengthen the overall quality of the manuscript.

In addition, we will make changes throughout the document to help clarify the main points and to address other reviewer concerns. Please find our responses below to each specific reviewer comment.

General comments from Anonymous Reviewer #2: 1. Reviewer's comment: This paper uses high-frequency (10-min intervals) time-series data on soil moisture content collected over a period of 9 months in 2005 at three different depths using automatic probes, and rainfall and other meteorological data. This study however does not use any observed groundwater level data from any study sites to compare or calibrate the modeling results with in-situ observed water-level records. Groundwater levels at three arbitrarily set depths (1m, 2m, and 3m below ground surface) are considered while running numerical models which, in fact, one of the weaknesses of the current paper. The authors should consider including some shallow groundwater level data in the revised version of this paper to strengthen their arguments.

Authors' response: Unfortunately, data on depth to water table are not available for the time period overlapping the field observations. However, previous data collection and analysis have provided a general picture of water table behavior at the site. We plan to provide a more detailed review of what others have demonstrated about the relationship between depth to water table and recharge in this setting. In addition, added clarity in our discussion of the motivation for the numerical model and parameter sensitivity experiments will hopefully alleviate the reviewer's concerns.

2. Reviewer's comment: No measurement of groundwater recharge to the sandy filled

aquifer (although cited some previous work on recharge) has been provided in the paper. Authors could just use simple water-table fluctuation method applied on time series records of ground- water levels to inform readers about how much rain-fed recharge occurs during the monsoon season. They can also characterize recharge events in the aquifer from observed water-level data and show readers the seasonal dynamics of recharge.

Authors' response: As noted above, data on depth to water table are not available for the time period overlapping the field observations. Previous work by others in this setting was able to elucidate general patterns of net recharge and we plan to enhance our discussion of that work. Since we don't have good control or measurements of boundary fluxes and water table fluctuations, our focus is on vadose zone fluxes and total recharge. We will make this distinction clearer in the revised manuscript and we hope this will address the reviewer's concern about water table fluctuations, precipitation events, and seasonality.

3. Reviewer's comment: Authors should also provide some data on groundwater abstraction that has been taken place from this filled aquifer and discuss how abstraction might influence recharge to this highly-permeable sandy aquifer. For example, in the Bengal Basin recharge to the regional, shallow alluvial aquifer has been substantially increased in areas of favorable surface geology and greater potential recharge due to long-term in- tensive abstraction for sustaining dry-season rice cultivation (see Shamsudduha et al., 2011 in Hydrogeology Journal).

Authors' response: As of the time of this work, there were no known groundwater abstractions from this area. It was recently constructed and was undeveloped at the time. The point that future abstractions could impact recharge is well-taken, however, and is part of the motivation for this work. We will include that in the discussion section of the revised manuscript.

Please also note the supplement to this comment:

http://www.hydrol-earth-syst-sci-discuss.net/8/C5067/2011/hessd-8-C5067-2011-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 8063, 2011.