Hydrol. Earth Syst. Sci. Discuss., 8, C4738–C4740, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C4738/2011/

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

Anonymous Referee #2

Received and published: 28 October 2011

General comments:

The paper entitled "Precipitation patterns and moisture fluxes in a sandy, tropical environment with a shallow water table" by Minihane and Freyberg in HESSD reports mechanisms of groundwater recharge in a sand-filled coastal aquifer in a humid tropical setting of Singapore using observed field monitoring data and numerical modeling. This paper highlights the importance of understanding groundwater recharge processes in the humid tropics and argues that rainfall amount to a particular threshold is more important than the peak rainfall intensity. The authors observed that rainfall

events of less than 3mm per event yield little to no direct rain-fed recharge to the sandy aquifer. They also argue that recharge greatly depends on the pre-existing soil moisture content prior to any rainfall events of greater magnitude take place. Finally, the paper presses that current water managers should consider the recharge mechanism and role of rainfall and soil moisture in order to manage water resources in the face of climate change and increased abstraction. Overall, this paper makes a substantial contribution in understanding soil moisture fluxes in a sandy aquifer in the humid tropic and the role of rainfall intensity in direct rain-fed recharge. However, there are a few weak areas where this paper can be revised for strength and clarity.

Major comments:

1. 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.

2. 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 groundwater 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.

3. 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 intensive abstraction for sustaining dry-season rice cultivation (see Shamsudduha et al., 2011 in Hydrogeology Journal).

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