

Interactive comment on “From precipitation to groundwater baseflow in a native prairie ecosystem: a regional study of the Konza LTER in the Flint Hills of Kansas, USA” by D. R. Steward et al.

Anonymous Referee #1

Received and published: 23 June 2011

Steward et al. have presented the results of an ecohydrological baseline assessment that was determined using the USDA model EPIC for the surficial processes and a combination of the USGS MODFLOW model and ArcMap to calculate subsurface processes. The assessment was performed in a study area located in the Flint Hills region of Kansas, USA. Although I do have some concerns I would like to see addressed in the manuscript, overall I think the methods used by the authors are sound. The remainder of this review will be a series of comments and concerns.

C2390

1. Starting on line 189, the authors write that the EPIC model was applied in this study using daily or larger time steps. This approach has some implications when determining water budgets. For example, consider a brief but intense rainfall event (e.g., < 2 hours) . Further assume that the incoming flux of the rainfall was intense enough that some of the soils could not fully adsorb it, resulting in runoff to the stream. In the model, this rain flux would be averaged over at least 24 hours, likely resulting in a larger portion of rainfall being partitioned into recharge instead of runoff. This potential error is cumulative over time and can result calculated recharge values that are higher than actual values.
2. What was the rationale for using a constant head boundary condition set to 20 m below the land surface along the lateral boundary of the MODFLOW model?
3. Are there any implications to be aware of or potential errors introduced into this work because the MODFLOW model only had one layer (i.e., ran in 2-D mode)?
4. The text starting on line 370 could be interpreted as the authors saying that most of the recharge is taking place in river valleys and foot slopes. Conversely, Freeze and Cherry (1979) state that the only immutable law is that highlands are recharge areas and lowlands are discharge areas. I do not think the authors are trying to disagree with what Freeze and Cherry wrote but this portion of their text should be clarified.
5. A comparison of Figures 5 and 8 seems to indicate that the EPIC and MODFLOW simulation results are in conflict. For example, Figure 5 clearly indicates that there is a zone of significant recharge all along the floodplain of the Kansas River (which by itself might be questionable). However, Figure 8 seems to show that the water table is higher than the land surface over large portions of this region. It does not seem possible to have recharge in a discharge zone. Please clarify.
6. Including the stream networks in Figures 7 and 8 makes the figures too busy. Please consider removing.

C2391

7. The word discharge should be replaced with recharge on line 457.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 4195, 2011.

C2392