Hydrol. Earth Syst. Sci. Discuss., 9, C1096–C1099, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C1096/2012/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Water-balance and groundwater-flow estimation for an arid environment: San Diego region, California" *by* L. E. Flint et al.

T. Rasmussen (Referee)

trasmuss@uga.edu

Received and published: 24 April 2012

General Comments

1. This article provides a comprehensive overview of the hydrologic conditions in the Greater San Diego watershed. A great diversity of hydrologic information from multiple sources is compiled and assimilated in the form of a watershed model. Results from the model provide a means for understanding and predicting hydrologic changes due to alternate management and climatic scenarios.

2. While the article is a excellent compilation of data and modeling results, it has little in terms of scientific merit. There are no new ideas or hypotheses presented, nor independent checks of model results. Possible independent checks might include environmental tracers (e.g., ^{14}C) to check for water ages and residence times, or geochemical tracers to show the evolution of water along a flowpath.

Specific Comments

1. The water budget considers many natural sources of water, such as precipitation. Yet, it is my understanding that substantial volumes of water are imported into the watershed from the Colorado River and other sources. It is not clear whether these volumes are important to the overall water budget. An additional statement related to the magnitude of these imports (as well as desalination inputs?) would be helpful.
2. Natural groundwater flow can be influenced by local additions from agricultural and landscape irrigation, stormwater retention, and leaking sewer and water lines in urban areas. Are there any data related to the magnitude of fugitive flows from urban systems?
3. Do stormflows from impervious surfaces in urban areas substantially affect the surface-water budget? I would assume that recharge at lower elevations would be small, with most of the water evapotranspirating under natural conditions. Yet, this evapotranspiration might be reduced in areas with substantial impervious surface, thus increasing stormwater runoff.
4. It appears that the study does not address groundwater pumping. Does this mean that groundwater withdrawals do not alter hydrologic conditions? Are there any aquifer recharge efforts, and if so, are they substantial? As an ancillary issue,

does groundwater pumping affect coastal saltwater intrusion or brackish water upconing?

Suggested Changes

1. Units of *million m^3/yr* are used in the paper. An equivalent unit is *GL/yr*, which is more compact and uses a standard metric prefix.
2. Page 2721, Line 10. You say that precipitation increases with distance inland. While true, would it not be more accurate to say that it increases with elevation. Elevation and distance inland are highly correlated. Is the fact that it decreases from north to south due to a change in elevation, or are the elevations similar?
3. Table 1. It would be helpful to add the elevation of the USGS stations.
4. Table 2. The discharge is called "Runoff" in this table. Does this mean *Stormwater Runoff*, or should it be *Discharge*. Is this the total discharge or the incremental discharge for the segment between the stations?
5. Table 8. The method by which the sum of squares weighted residuals is calculated is not defined. Because streamflow is highly heteroscedastic (i.e., the error in measurement is highly correlated to the magnitude of the observation), we normally fit the log_{10} transform of discharge instead of the simple, untransformed discharge. The logarithmic transforms implies an error that is proportional to the magnitude of the observation, e.g., five percent, which is what is usually expected. Is this what was done? If so, this should be indicated.
6. Figure 5. The figure indicates that the coast drops precipitously - i.e., there is no continental shelf. Is there a saline water wedge (halocline) along the Pacific Ocean? How was the boundary condition handled here?

7. Figure 7. Would it be possible to indicate the reservoir locations? Do they receive imported water?
8. Figure 8. Are the decadal averages significantly different? Would a Kruskal-Wallis (homogeneity) test show a difference?
9. Figure 9. Would it be possible to indicate the recharge and runoff efficiencies (i.e., divided by the precipitation)? Is there a correlation between these efficiencies and elevation?
10. Figure 10. It might be helpful to plot this using a log-log scale because the regression lines are linear on that plot.
11. Figure 11. It would be helpful to show discharge using a logarithmic scale (GL/mo) in order to resolve lower flows. Also, the grey shading for the background is not helpful.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 2717, 2012.