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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling the effects of climate and land cover change on groundwater recharge in south-west Western Australia" *by* W. Dawes et al.

Anonymous Referee #2

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HESS Review This is an interesting study evaluating the relative impacts of climate change, soil type, and land use change on groundwater recharge in SW Australia. These are the primary drivers of recharge and it is important to consider all three when evaluating spatial and temporal variability in recharge. Most studies focus on either climate variability/change or land use change and few combine these drivers to determine their net effect on groundwater resources. The authors are commended for tackling this complex issue and trying to disaggregate the two effects. The study region encompasses a wide number of case studies that show situations where reductions in precipitation are amplified in terms of recharge impacts or in other cases

expected reductions in recharge caused by climate change are overwhelmed by effects of land use change (plantation removal etc) causing increases in recharge. The large number of case studies sometimes makes it difficult to follow the various cases. It might be a good idea to make a simple table with the different conceptual scenarios for the various cases. The abstract should be significantly shortened and the information provided in a much simpler format without going into too much detail. It seems that precipitation decreased in all cases; however, the recharge response varies with soil type and land use change. The authors might consider including the following reference where decadal droughts in the 1970s through 1990s did not decrease recharge because land use change from native savanna to millet crops greatly increased recharge, overwhelming the effects of the climate variability. Favreau, G., B. Cappelaere, S. Massuel, M. Leblanc, M. Boucher, N. Boulain, and C. Leduc (2009), Land clearing, climate variability, and water resources increase in semiarid southwest Niger: A review, Water Resources Research, 45, W00A16, 10.1029/2007WR006785.

The modeling analysis is very good and provides an excellent approach for isolating controls on recharge. Although a reference is provided for the future climate scenarios, it might be good to include a little information on the GCMs used and the downscaling approach or this could be included in Supporting Online information. The study area is excellent because it provides a range of situations that all include reductions in precipitation but changes in land use that could increase or decrease recharge. Changes in land use can provide positive or negative feedbacks on climate change. The sensitivity analysis is very good for assessing relative impacts of climate, soil type, and vegetation. Other papers that may be worth citing include Green, T. R., M. Taniguchi, and H. Kooi (2007), Potential impacts of climate change and human activity on subsurface water resources, Vadose Zone J., 6(3), 531-532. Ng, G. H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon (2010), Probabilistic analysis of the effects of climate change on groundwater recharge, Water Resources Research, 46, W07502, doi:07510.01029/02009WR007904.

The study is complex because of the competing effects of climate change, land use change and soil texture effects but the authors have done a very good job of evaluating these issues and explaining the relative importance of each in different situations.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 6063, 2012.