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Hydrol. Earth Syst. Sci., 14, 2399-2414, 2010
www.hydrol-earth-syst-sci.net/14/2399/2010/
doi: 10.5194/hess-14-2399-2010

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Confirmation of *ACRU* model results for application in land use and climate change studies

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Abstract. The hydrological responses of a catchment are sensitive to land use and climate, and changes thereof. The hydrological responses to the impacts of changing land use and climate can be the result of complex interactions, where the change in one may moderate or exacerbate the effects of the other. Further difficulties in assessing these interactions are that dominant drivers of the hydrological system may vary at different spatial and temporal scales.

To assess these interactions, a process-based hydrological model, sensitive to land use and climate, and changes thereof, needs to be able to use a hydrological model such as *ACRU* with confidence. For this purpose the daily time step *ACRU* model was selected. However, representation of reality must be confirmed by comparing simulated against observations across a range of climatic conditions. Comparison of simulated against observed streamflow was undertaken in three climatically diverse South African catchments, ranging from the semi-arid sub-tropical Luvuvhu catchment, to the winter rainfall Upper Breede catchment and the sub-humid Mgeni catchment. Not only do the climatic conditions of the catchments differ, but their primary land uses also vary. In the areas of the Mgeni catchment commercial plantation forestry is dominant while in the middle reaches there are significant areas of commercial plantation sugarcane and urban areas, while the lower reaches are dominated by urban areas. The Luvuvhu catchment has a large proportion of subsistence agriculture and informal residential areas. In the Upper Breede catchment in the Western Cape, commercial orchards and vineyards are the primary land uses.

Overall the *ACRU* model was able to represent the high, low and intermediate flows, with satisfactory Nash-Sutcliffe efficiency indexes obtained for the selected catchments. The study concluded that the *ACRU* model can be used with confidence to simulate the streamflows of the three selected catchments and was able to represent the hydrological responses to a range of climates and diversity of land uses present within the catchments.

[Final Revised Paper](#) (PDF, 7249 KB) [Discussion Paper](#) (HESSD)

Citation: Warburton, M. L., Schulze, R. E., and Jewitt, G. P. W.: Confirmation of *ACRU* model results for applications in land use and climate change studies, Hydrol. Earth Syst. Sci., 14, 2399-2414, doi:10.5194/hess-14-2399-2010

