

Interactive comment on “A channel transmission losses model for different dryland rivers” by A. C. Costa et al.

Anonymous Referee #2

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The authors address an extremely important topic for dryland rivers, namely the simulation of transmission losses as a flood wave moves down a river channel. They produce a generally sound review of the literature, and construct a complex numerical model, which represents channel surface water flow, infiltration through a stratified alluvium, the vertical redistribution of unsaturated soil moisture, and groundwater flow, both lateral and longitudinal. The component processes in the model are individually subject to various simplifying assumptions and represented by various numerical approximations, subject to numerical coupling. The first major problem I have with this paper is that there is apparently no consideration given to the accuracy of the component approximations or the various numerical schemes. The processes are highly non-linear and there is nothing in the paper to convince the reader that the approxima-

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tions are appropriate in representing the component processes for this application, or that the spatial and temporal discretization and numerical approximations are such that the model is numerically stable and accurately representing the governing equations. For example, infiltration in a multi-layer alluvium under transient flow is a highly complex area for numerical simulation, and careful attention must be given to the numerical performance. In fact the paper gives no information on the space and time steps used, let alone any discussion of numerical issues. A second area of concern is the fact that a complex model is used in situations where there are very limited data. Of course this is a generic problem for this topic, but without any validation of the internal processes, the information content of the data is too limited to draw conclusions about the validity of the process representation. A related point is that there will inevitable be large uncertainty in characterising the surface system – due to lack of data and the spatial heterogeneity that is referred to in the literature review. A plausible way forward would be to develop alternative equally feasible interpretations of the surface and in particular subsurface heterogeneity and explore the associated model sensitivity. I would guess for example that alternative equally plausible realisations of subsurface profiles would give very different results. A further area of concern is that some of the model results for Walnut Gulch fail to capture basic characteristics of the observed hydrograph. There would need to be extensive discussion and analysis of these results if the authors are to convince the reader that the model is physically plausible.

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