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# Regional-scale hydrological modelling using multiple-parameter landscape zones and a quasi-distributed water balance model

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Abstract. Regional-scale catchments are characterised typically by natural variability in climatic and land-surface features. This paper addresses the important question regarding the appropriate level of spatial disaggregation necessary to guarantee a hydrologically sound consideration of this variability. Using a simple hydrologic model along with physical catchment data, the problem is reconsidered as a model parameter identification problem. With this manner of thinking the subjective nature as to what to include in the disaggregation scheme is removed and the problem reconsidered in terms of what can be supported by the available data. With such an approach the relative merit of different catchment disaggregation schemes is viewed in terms of their ability to provide constrained parameterisations that can be explained in terms of the physical processes deemed active within a catchment. The outlined methodology was tested for a regional-scale catchment, located in eastern Australia, and involved using the quasi-distributed VIC catchment model to recover the characteristic responses resulting from the disaggregation of the catchment into combinations of climate, soil and vegetation characteristics. A land-surface classification based on a combination of soil depth and land cover type was found to provide the most accurate streamflow predictions during a 10-year validation period. Investigation of the uncertainty associated with the predictions due to weakly identified parameters however, revealed that a simpler classification based solely on land cover actually provided a more robust parameterisation of streamflow response. The result alludes to the hydrological importance of distinguishing between forested and non-forested land cover types at the regional-scale, and suggests that given additional information soil-depth / storage considerations may also have proved significant. Improvements to the outlined method are discussed in terms of increasing the informative content available to differentiate between competing catchment responses.

Keywords: regional-scale, spatial variability, disaggregation, hydrotype, quasi-distributed, parameterisation, uncertainty

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