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Credibility of Hydrologic Models in the Context of Climate Change Impact Studies - A Case Study in the Olifants Basin, South Africa

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A major challenge for hydrologic research in the coming years will be the assessment of climate change impacts on regional water resources. While more and more impact studies are being performed, the assessment of hydrologic changes across a region, particularly in less developed countries, is often severely limited by the lack of streamflow gauges to calibrate watershed models and hence large uncertainties of model predictions. Further, one has to ask the general question of how we can increase the credibility of watershed models in the context of climate change studies, where, by definition, the model's credibility cannot simply be derived from its performance in reproducing historical observations. The study region is the Olifants basin in South Africa, a UNESCO HELP basin that is characterized by severe water insecurity and regular hydrologic extreme events. We will demonstrate how we can trade space-for-time by using spatial gradients as first order approximation of temporal changes in watershed behavior to derive ensemble predictions at both gauged and ungauged sites. In general, there is an urgent need to re-think how we identify, use and evaluate hydrological models under non-stationary conditions to increase the value of studies such as this one for water resource planning and decision making.