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# A Comparison of IHACRES Ensemble Streamflow Predictions in California's Mediterranean Climate Region

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Parsimonious model structures and ensemble prediction techniques have been developed in an attempt to reduce predictive uncertainty in rainfall-runoff models. This study presents a methodology which utilizes the parsimonious IHACRES model structure to generate multi-parameter ensemble streamflow predictions in California's Mediterranean climate region. Use of this methodology requires a number of subjective decisions be made, particularly with respect to the number of parameter sets to include in the ensemble prediction. This study examined the utility ensemble model predictions made with a range of different ensemble sizes, as well as predictions made using a traditional single parameter set approach.

The IHACRES model structure with the Ye et al. (1997) loss module extension was calibrated on fourteen watersheds over two separate five year periods. Parameter set performance was ranked based on their performance during model conditioning, with the intent of identifying suites on parameter sets for use in ensemble predictions. The top twenty-five, fifty, and one-hundred ranked parameter sets were used to generate ensemble predictions over an independent validation period. The predictive performance of the three ensemble sizes were compared against each other, as well as against predictions made using the single best parameter set.

The difference in the predictive performance between the ensemble predictions was minimal, with no preferred ensemble size evident. Similar results were seen in the comparison between the ensemble predictions and single parameter set predictions, where no difference in predictive performance was seen in most cases. The similarity of predictive performance was a reflection of the high degree of parameter set calibration equifinality. Calibration typically produced a large number of parameter sets that produced similar hydrograph representations. As a result, when these parameter sets were used in ensemble predictions over an independent data period, they generated similar predictive results.