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Assessment of soil-based and calibrated parameters of the Sacramento model and parameter transferability to ungauged river basins

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The Sacramento Model (SAC-SMA) was calibrated to 12 Model Parameter Estimation Experiment (MOPEX) river basins using a combination of manual and automatic (SCE-UA) calibration. Two sets of parameters were developed for each basin: those based on calibration (CAB) and those derived from soil-based algorithms (SoiB). Split-sample tests (20 years for calibration and 19 years for Testing or validation) of simulated hydrographs using CAB based parameters and SoiB based parameters were made to judge model effectiveness. Generally, simulations based on CAB parameters were superior to SoiB based simulations, though neither was satisfactory. To test for calibrated model parameter transferability, CAB parameters of each MOPEX basin were applied to the other 11 river basins (IntCAB). In terms of Bias the 144 sets of IntCAB results obtained were similar to SoiB parameters, but slightly inferior in terms of the NashSutcliffe coefficient (Ef). In an attempt to enhance parameter transferability, CAB parameters of basin j applied to basin i were re-scaled (IntCABSoiB), but the end results were similar to IntCAB, except the Bias statistics were marginally improved. Finally, IntCAB results in terms of the median Ef were regressed against basin simple hydrologic similarity measures computed in terms of the median Euclidean distance derived from: (a) three annual water budget measures (HED1, HED2, HED3), (b) monthly greenness fractions (GFED), and (c) physical arc distance (ArcDist). A simple regression between the median Ef and the median HED1, HED2, HED3 has a R2 of 0.5, 0.48, and 0.47, respectively, which shows that HED is a lim-

ited indicator of hydrologic similarity. R2 drops to about 0.3 when GFED is used to represent the hydrologic similarity. There was no predictive relationship between the median Ef and the median ArcDist.