EMERGENCE OF LANDSCAPE ECOHYDROLOGICAL PATTERNS FROM MERGING REMOTELY-SENSED VEGETATION DYNAMICS AND A PARALLELIZED HYDROLOGIC MODEL

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Computational ecohydrology is challenged to account for the regional dynamics of terrestrial ecosystems experiencing strong seasonality in productivity and biomass. This project focuses on understanding the spatiotemporal variability of ecohydrological conditions in a large watershed of northwest Mexico influenced by rainfall during the North American Monsoon. To assess the implications of the ecosystem seasonality, we combine remote-sensing observations of terrestrial conditions with a distributed hydrologic model - the TIN-based Real-time Integrated Basin Simulator (tRIBS). Numerical experiments are carried out in the Rio San Miguel (~3500 km2) river basin in Sonora, Mexico, over the period May 2004 to June 2005 to encompass the intense observation period during SMEX04-NAME. Using the model, we evaluate the impact of dynamic greening on soil moisture, evapotranspiration and soil temperature fields, in comparison to cases where the phenological changes are withheld from the model (static leaf-on and leaf-off). We then analyze the spatiotemporal ecohydrologic patterns that emerge in the basin which encompasses ecosystems organized with elevation and latitudinal gradients. To capture regional variations in meteorological forcing, we utilize gridded products from the North American Land Data Assimilation System (NLDAS) adjusted using available ground observations. We compare the distributed outputs of the dynamic and static scenarios with remote sensing products of land surface temperature (MODIS, ASTER, LandSat), aircraft-based soil moisture estimates (PSR and 2DSTAR) and ground observations of soil moisture/temperature and evapotranspiration. The results provide a better understanding of the impact of dynamic vegetation on ecohydrological patterns and their nonlinear propagation to other hydrological variables of interest, including runoff generation mechanisms and channel network streamflow.