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GEWEX Water and Energy Budget Studies

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During the past several years, the Global Energy and Water-Cycle Experiment (GEWEX) Continental Scale Experiments (CSEs) began to attempt to develop the "best available" description of global and regional atmospheric and land water and energy budgets. Since few regional or global hydroclimatological observations were available when these water and energy budget studies began, initial studies mainly included global and regional atmospheric analyses along with macroscale hydrologic models. Although the analysis systems are still highly model dependent, at least there are many more observational constraints than free running general circulation models. Still, the level of uncertainty in the closure remained high. Fortunately, a number of observationally based GEWEX data sets have now since become available, including: the Global Precipitation Climatology Project (GPCP) precipitation, International Satellite Climate Comparison Project (ISCCP) and Surface Radiation Budget (SRB) radiation, the Global Runoff Data Center (GRDC) runoff. Other globally gridded observations sets are also becoming available. We have therefore begun to compare the National Centers for Environmental Prediction / National Center for Atmospheric Research (NCEP/NCAR), NCEP / Dept. of Energy (DOE), European Centre for Medium Range Forecasts (ERA40), and Japanese Meteorological agency reanalyses, and the Global Land Data Assimilation output to these GEWEX sponsored observations in order to assess our current uncertainty to characterize and close continental-scale water and energy budgets. As will be shown, the closure errors are not small. However, individual process errors in these models, which tend to cancel, are likely much larger. For example, analysis precipitation errors are likely balanced mainly by evaporation errors; errors in other hydrometeorological processes, such as regional runoff and moisture convergence, are almost as large, especially for certain regions, such as the Amazon and GAME tropics.