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The current status of the Second Global Soil Wetness Project (GSWP-2)

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The Second Global Soil Wetness Project (GSWP-2) is an environmental modeling research activity of the Global Land-Atmosphere System Study (GLASS) of the Global Energy and Water Cycle Experiment (GEWEX). It focuses on the same core 10-year period as International Satellite Land-Surface Climatology Project (ISLSCP) Initiative II (1986-1995). The goals of GSWP-2 are to produce state-of-the-art global data sets of land surface fluxes, state variables, and related hydrologic quantities; develop and test large-scale validation, calibration, and assimilation techniques over land; provide a large-scale validation and quality check of the ISLSCP data sets; compare land surface schemes (LSSs), and conduct sensitivity studies of specific parameterizations and forcings, which should aid future model and data set development.

GSWP2 is an offline land-surface modeling. Meteorological forcings are hybrid products of NCEP/DOE reanalysis, observational data and satellite data, and provided at 3-hourly time step for a period of thirteen and half years from July 1982 to December 1995. First three and half years' data is used for spin up. The land surface parameters are specified from the ISLSCP Initiative II data set which is derived from Earth Resources Observation and Science Data Center (EDC) for land cover data and International Geosphere-Biosphere Programme Data Information System (IGBP-DIS) for soil data. Both land surface parameters and meteorological forcings are at one degree resolution for all land grids excluding Antarctica. Baseline integrations and sensitivity studies from over a dozen participating models have been submitted to the Inter-Comparison Center (ICC) of the GSWP2.

Soil wetness is an important component of the global energy and water balance. It is a reservoir for the land surface hydrological cycle, and controls the partitioning of land

surface heat fluxes. Soil wetness is unknown over most of the globe since it is difficult to measure in situ and remote sensing techniques are partially effective. Offline LSSs simulation is one of the few practical approaches.

The structure and parameterization of soil moisture varies among LSSs, from 1 layer bucket scheme to 10 layer vertical soil moisture transfer scheme. The output also varies among LSSs, which is larger than inter-annual variability.

No model is immune to problems, therefore, it is expected that simple ensemble mean or some statistical processing of the submitted outputs from the LSMs will provide the state-of-the-art information on the global energy and water balance. Several methods of combining individual LSS calculations are examined and evaluated. Through validation with in situ measurements that was provided by Global Soil Moisture Data Bank, it was shown that diverse renditions of single analysis compiled from an ensemble of different LSSs usually outperform individual members in terms of metrics of skill employed in this study. Among applied methods, multiple regression style ensemble mean showed the best performance. However, a preliminary transferability study that was conducted for transferring ensemble forecast parameters between areas with similar climate regime suggested the method had poor transferability and simple ensemble mean was only practically applicable for GSWP-2.

GSWP-2 is now transitioning from the modeling to the analysis phase. Intensive analyses are conducted by participants. All GSWP-2 outputs can be viewed and downloaded at ICC web site (http://gswp2.tkl.iis.u-tokyo.ac.jp/gswp2/). The ensemble mean outputs of participating LSSs, not only soil moisture but also all other variables, will be published in spring 2005.