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# Land Data Assimilation Systems

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Accurate initialization of land surface water and energy stores is critical in environmental prediction because of their regulation of land-atmosphere fluxes over a variety of time scales. Errors in land surface forcing and parameterization accumulate in these integrated land stores leading to incorrect surface water and energy partitioning. However, many new land surface observations are becoming available that may be used to constrain the dynamics of land surface states. These constraints can be imposed by (1) forcing the land surface primarily by observations, thereby avoiding the often severe numerical weather prediction biases, and (2) using data assimilation techniques to constrain unrealistic storage dynamics. This is the goal underlying the Land Data Assimilation Systems (LDAS) conceptual framework which aims to develop the best estimation of the current state of land surfaces through a best possible integration of land surface observation and simulation.

Significant progress has been made in land-surface observation and modeling at a wide range of scales. Projects such as the International Satellite Land Surface Climatology Project (ISLSCP), the Global Soil Wetness Project (GSWP), and the GEWEX Continental-Scale International Project (GCIP), among others have paved the way for the development of an operational LDAS. Several LDAS systems have been implemented in near real time and at high spatial resolution for North American, European, and global domains. These LDASs are forced with real time output from numerical prediction models, satellite data, and radar precipitation measurements, and can incorporate land state observations as a constraint to the model dynamics using hydrologic data assimilation methods. Results of LDAS assimilation of land surface temperature, moisture, and snow are showing great promise to improve predictability and understanding of model realism.