18th Conference on Climate Variability and Change
20th Conference on Hydrology

JP1.14

Advanced computing, data access and distribution technologies, and interoperable tools enable high resolution coupled land-atmosphere prediction

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Interactions between the atmosphere and the land surface have considerable influence on regional and global climate variability. Therefore, coupled land-atmosphere systems that can realistically represent these interactions are critical for improving our understanding of the atmosphere-biosphere exchanges of energy, water, and their associated feedbacks. NASA's Land Information System (LIS) is a high resolution land data assimilation system that integrates the use of high resolution satellite and observational data, advanced land surface models, data assimilation techniques, and high performance computing tools. LIS uses the Earth System Modeling Framework (ESMF), which is a software framework for fostering interoperability, portability and code reuse in Earth Science applications. ESMF provides a number of utilities that can be customized to enable interaction between different Earth system model components. Using ESMF tools, LIS has been coupled to the Weather Research and Forecasting (WRF) and the Goddard Cumulus Ensemble (GCE), enabling high-resolution land-atmosphere modeling systems. In addition to employing interoperable frameworks such as ESMF, the coupled systems also provide distributed data access, transport, translation, and distribution capabilities using the Grid Analysis and Display System/Distributed Oceanographic Data System (GrADS/DODS-GDS) server. The GDS server based tools employ hierarchical data models and metadata-driven user interfaces for efficient data mining and visualization. The integrated use of these technologies helps in the effective application of the coupled land-atmosphere systems to understand and predict water and energy cycling.

Joint Poster Session 1, Land-Atmosphere Interactions (Joint with 18th Conference on Climate Variability and Change and 20th Conference on Hydrology)
Tuesday, 31 January 2006, 9:45 AM-11:00 AM, Exhibit Hall A2

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