Overview: Several prior land surface initialization studies using the NASA-Unified Weather Research and Forecasting model (NU-WRF) (e.g., Case et al. 2008; Santanello et al. 2016) and idealized multi-global model ensemble experiments (e.g., Guo et al. 2006; Koster et al. 2010; Koster et al. 2010; Koster et al. 2006; Seneviratne et al. 2013; van den Hurk et al. 2012) have demonstrated the knock-on impact of realistic surface states on short-term to sub-seasonal surface air temperature and precipitation forecasts, respectively. The role of land-atmosphere (L-A) coupling is clearly isolated in these aforementioned modeled cases. However, an open question is: What is the realism of the modeled coupling? Due to observational constraints, models have been poorly, if ever evaluated for coupling realism (Roundy et al. 2014). What is further troubling is that even in so-called coupling ‘hot spots’, the inter-model spread is substantial (i.e., Koster et al. 2004; their Fig. 1 insets). As the climate modeling community moves from atmosphere-ocean global climate models (AOGCMs) to Earth System Models (ESMs) with dynamic vegetation and fully-coupled carbon, energy, and water cycles, realistic L-A coupling becomes of central importance.

Objectives and Approaches: We are actively working with counterparts on the Global Land-Atmosphere System Study (GLASS) and Global Hydroclimatology (GHP) panels of the Global Energy and Water Exchange Project (GEWEX) to meet the following (2) objectives:

(2) Improve our ability to measure L-A coupling across major climate zones at multiple scales.

Approach: (a) Fill current L-A coupling related observing system gaps with ground station supplements (e.g., remote sensing atmospheric profilers at FLUXNET sites). (b) Conduct targeted seasonal (e.g., Ferguson et al. 2014) and multi-year field campaigns (e.g., GEWEX North American Regional Hydroclimate Project). (c) Secure enhanced spaceborne monitoring capabilities (e.g., Hyperspectral Environmental Sounder for: water vapor and temperature profiles in the lower troposphere, height of the PBL, and PBL entrainment, as a next Decadal Project).

In the figures that follow we present a few highlights from our most recent activities.
REFERENCES


