FERGUSON LAB.

[Satellite remote sensing of land surface-atmosphere interactions]

Department of Human and Social System

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Global Hydrological System

Department of Civil Engineering

Integrating satellite remote sensing to improve monitoring and modeling of terrestrial hydrology

Remote sensing of the water budget

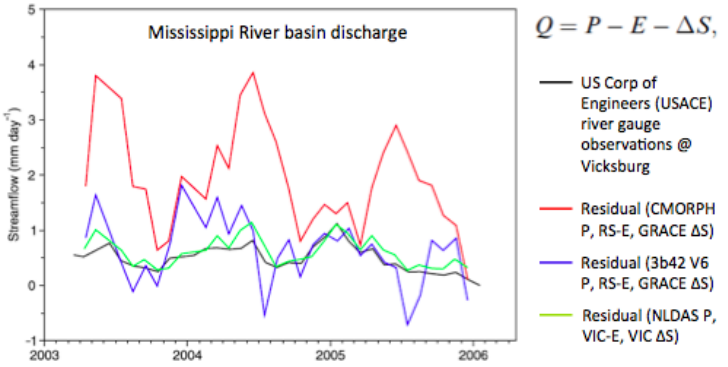

Figure 1: Estimates of the Mississippi River discharge using various sources; The red line is an estimate derived entirely from satellite remote sensing without bias correction.

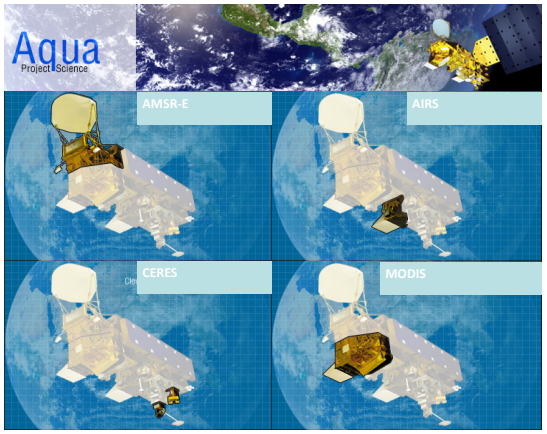

Figure 2: 4/6 sensors on the NASA Aqua satellite platform, which form the observational basis for much of Dr. Ferguson's research.

Dr. Ferguson's research focuses on quantifying the mean state and variability of the hydrologic cycle (Fig. 1), its sensitivity to climate and global change, and the predictability of change through the quantitative application of satellite remote sensing and modeling (Fig. 2). The value of remote sensing observations is that they integrate process heterogeneity and anthropogenic controls (e.g., land cover/land-use change, irrigation, reservoirs, and inter-basin transfers) that are either missing or imperfectly represented in models. They also provide global coverage from a consistent observing platform, which makes them the only feasible means for studying across-scale processes over extended periods of time. Dr. Ferguson's role is to realize the extraordinary potential that the existing, unprecedented records of remote sensing land surface state, radiative forcing, and atmospheric profiles have to offer. Dr. Ferguson specifically focuses on: (1) multi-sensor satellite remote sensing of atmospheric profiles, soil moisture and evapotranspiration; (2) land-atmosphere interactions; (3) climate model evaluation, and (4) diagnosing the hydrological response to climate change.

As an elected member of the World Climate Research Programme (WCRP) Global Energy and Water Exchanges (GEWEX) Local Coupling (LoCo) working group, Dr. Ferguson currently leads efforts to benchmark observations and diagnosis of land-atmosphere interactions. The principle objective is to understand and quantify the relative roles of the land (local) and atmospheric (external) forcing on weather and climate.

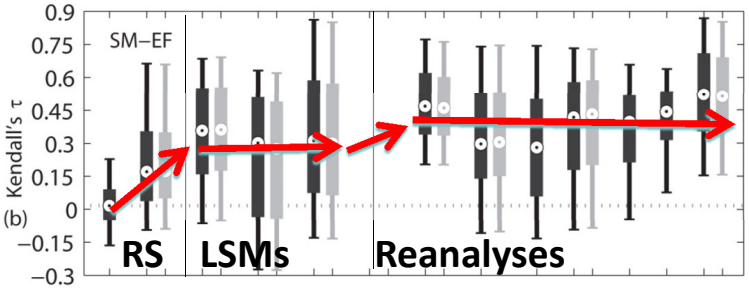

Figure 3: Boxplot summary of the global soil moisture-evaporative fraction nonparametric correlation from satellite remote sensing (RS), off-line land surface models (LSMs), and atmospheric reanalyses.

Dr. Ferguson was the first to show that land-atmosphere coupling in models –on a global basis- was unrealistically strong when compared with satellite-based estimates (Fig. 3).