Report as of FY2007 for 2006NM38B: "A Physically Based Parsimonious Approach for Spatial Disaggregation and Recovery of NEXRAD Precipitation Data in Mountainous Terrains (Wilson)"

Publications

- Articles in Refereed Scientific Journals:
  - Guan, H., J.L. Wilson, and O. Makhnin. 2005. Geostatistical Mapping of Mountain Precipitation Incorporating Autosearched Effects of Terrain and Climatic Characteristics. Journal of Hydrometeorology. 6:6:10181031.

Report Follows

Problem and Research Objectives

The temporal and spatial variability of precipitation controls many terrestrial hydrologic processes and states. Common remotely sensed precipitation products used to estimate precipitation have a spatial resolution that is often too coarse to reveal hydrologically important spatial variability. NEXRAD precipitation fields are one such product. This study is aimed at further developing and testing a physically-based statistical approach to spatial disaggregation using NEXRAD precipitation data.

Methodology

A parsimonious physically based multivariate-regression algorithm, referred to as multi-level cluster-optimizing ASOADeK regression, is developed for downscaling low-resolution spatial precipitation fields. This algorithm auto-searches precipitation spatial structures (e.g., rain cells), and atmospheric and orographic effects to estimate precipitation distribution without prior knowledge of the atmospheric setting. The only required input data for the downscaling algorithm are a large-pixel precipitation map and the DEM map of the area of interest.

If the proposed algorithm performs well in tests, it will provide a tool to significantly improve existing NEXRAD precipitation estimates in mountains. The spatial disaggregation approach is also applicable to other low resolution remote sensing precipitation products (e.g., TRMM) and modeling precipitation products (e.g., PERSIANN). Based on this, we can generate high-resolution precipitation maps from current remote sensing products. This will significantly improve the atmospheric boundary conditions for near-surface hydrologic modeling, better test the hydrologic models, and improve their predictive capability. The algorithm can also be embedded into hydrologic modeling codes using NEXRAD precipitation an input, or in climate modeling codes to improve the spatial resolution of the output precipitation estimates.