Rainfall variability introduced by data collection methods

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Sandra Kinnaman is a hydrologist within the U. S. Geological Survey's Hydrologic Records Section of the Florida Integrated Science Center, Center for Aquatic Resource Studies. Sandra came to the USGS in 2000 from working as an environmental consultant. During her time at the USGS she has been involved with an evapotranspiration study relating to the Greater Everglades Ecosystem Restoration in addition to coauthoring the semi-annual publication of the potentiometric surface map of the Upper Floridan Aquifer since September 2001. In 2003 she was tasked with overseeing the data collection and quality assurance of rainfall data collected by the Hydrologic Records Section within the central Florida region.

Sonny Anderson and Edward Simonds are hydrologic technicians within the U. S. Geological Survey's Hydrologic Records Section of the Florida Integrated Science Center, Center for Aquatic Resource Studies. As hydrologic technicians, their primary duty is data collection and both have extensive knowledge of instrumentation of monitoring stations. Both coauthors have supported the development and implementation of the study and continue to assist in the data collection process.

Abstract

Rainfall is the primary input to the hydrologic budget. Rainfall data are being used for studies ranging from simple water budgets to large complex computer models. Naturally occurring variability, especially spatial variability, is acknowledged and can be compensated for by various statistical techniques; however, variability introduced by the rainfall data collection process is rarely considered and could be significant. Two main sources of error exist: the effects of "non-ideal" data collection conditions, and instrument limitations. Entities such as the National Oceanic and Atmospheric Administration and the World Meteorological Organization have very specific protocols for collecting quality rainfall data. These require the data collection to be under "ideal conditions" such as the use of ground-level gages or wind shields to reduce wind-induced errors. However, data are rarely collected under such conditions. How does not meeting these standards increase the error in the measurement, and by what amount? The second source of error in the collection of rainfall data is from the limitations of the instrumentation. Accuracy of rain gages varies with instrument design and rainfall intensity. Quantifying the variation in point measurements of rainfall resulting from instrument type and rainfall intensity variations is important for consistent interpretation of rainfall data. By identifying and reducing the main sources of error in the data-collection process, higher quality data can be achieved.