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Monitoring runoff processes at high spatial and temporal resolution – scientific success or operational nightmare?

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The influence of the spatial variability of soil hydrological properties (water retention curve, saturated hydraulic conductivity, preferential pathways) and the spatial and temporal variability of rainfall or snow melt and soil water content on runoff generation is still challenging to observe in larger watersheds. Focusing on individual processes, studies were able to describe and sometimes predict details of the observed variabilities. Understanding the combined responses, however, has been difficult. New technology of small sensors and inexpensive data loggers is emerging and many hydrologists have started to use these instruments in experimental watersheds to better capture the spatial and temporal variability. However, collecting data and performing QA/QC can be time consuming and difficult. Wireless sensor networks are now becoming more user-friendly and affordable and the companies promise that this is the new revolution in environmental monitoring. I will present two applications: the use of 100 inexpensive temperature sensors to measure snowmelt processes in a watershed and the set-up and deployment of a wireless sensor network to measure rainfall, temperature, soil moisture, and ground water level at 50 locations in a watershed. I will discuss the scientific possibilities, but also the operational problems, and will conclude with recommendations for future users.