



Development and testing of a reactive wireless sensor network for soil moisture monitoring

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Process studies in catchment hydrology are faced with the problems of increasing field costs and reliability of data acquisition in remote and extreme environments. Wireless sensor systems that can store and transmit data to remote websites offer a potentially cheap and reliable solution. However, battery life has been a particular limitation in the development of cheap miniaturized systems. A solution to the problem of battery life is to develop a new generation of *reactive* wireless sensor systems. This paper describes the development and implementation of such a system for monitoring soil moisture. The novelty of the system is the built-in reactivity to rainfall events. When soil moisture is changing rapidly during rainfall events, data is collected frequently, whereas during drier periods between events data is collected less often. This approach is consistent with the highly non-linear nature of soil moisture flow in unsaturated soils and ensures that only significant soil moisture changes are recorded and transmitted, thereby considerably extending the active recording period. To trigger the system we use a wireless raingauge with programmed event-condition-action rules that respond to 1 mm of rain as a reactive trigger and 2 hrs without a rain signal as an indication that rain has ceased. At this time the sensing period is amended from minutes to hours.

Initial testing has been undertaken in a native woodland overlying a superficial groundwater resource 50 km north of Perth, Western Australia. This environment is characterized by high spatial variability of infiltration due to the hydrophobic nature of surface sands and redistribution of rainfall by vegetation. Field trial results on the reactivity, robustness and longevity of the network are presented and proposed future modifications are described.