Geophysical Research Abstracts
Vol. 20, EGU2018-11406, 2018
EGU General Assembly 2018

Current hydrological experiments and related research achievements at Chuzhou Hydrological Experimental Site in China

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Hydrology, to date, has confronted its developmental bottleneck due to lack of new monitoring and experimental data for hydrological processes in watersheds. Fortunately, new concepts and techniques have been emerging to better meet the demands in the acquisition of new monitoring and experimental data. In addition, some artificial experimental catchments or watersheds, whose boundaries and inner structures can be designed and defined in advance, have been established to investigate hydrological processes under well-controlled conditions. In order to clarify the mechanism and regularity of watershed hydrological cycle, this study designs hydrological experiments with coupled natural and artificial system using two-direction multi-scale approach, i.e. upward and downward. Thus, hydrological experiments at Huashan Watershed in Chuzhou City, representative of the low-altitude warm region in China, are designed and being performed by adopting new and advanced monitoring techniques and equipments.

Within Huashan Watershed with a drainage area of 80.0 km^2, two representative watersheds are selected: Sanchahe Watershed (17.6 km^2) and Huangwa Watershed (2.6 km^2). Four smaller catchments act as critical zone experimental blocks, including Wangying Catchment (0.27 km^2), Gaochong Catchment (0.08 km^2), Nandadish Catchment (0.008 km^2) and Hydrohill Catchment (artificial, 0.0005km^2). These catchments or watersheds join together to form an excellent multi-scale experimental system, including artificial and natural experimental blocks. At the outlets of Wangying, Gaochong, Huangwa, Sanchahe, and Huashan watersheds, V-notch weirs grooves and hydrological cables have been combined to observe total stream discharges. Hydrohill and Nandadish catchments have been well instrumented to automatically measure hydrological elements such as precipitation, discharge, soil moisture, groundwater level, and evapotranspiration with high precision. In addition to the above measurements of water quantity related hydrological elements, precipitation, stream water, soil water, and groundwater in Hydrohill Catchment, Nandadish Catchment, Sanchahe Watershed and Huashan Watershed are sampled at different location through water sampling systems designed and manufactured by ourselves to determine the δ^2H, δ^{18}O, EC, pH, DO, and concentration of main ions.

As one of the important experiments within this site, through the measurement error analysis for rainfall gauges, two kinds of measurement error can be verified and error correction methods are also proposed. One is that tipping-bucket rainfall gauges with different resolution may produce different measurement error sizes under certain rainfall intensity, and tipping-bucked rainfall gauges with higher resolution lead to small error under low rainfall intensity, while vice versa. Therefore, it is suggested to use two kinds of tipping-bucked rainfall gauges with both high resolution and low resolution together to measure the rainfall at a certain location. The other is that the wind has significant effect on the measurement of rainfall, so special windshields are suggested to be installed around rain gauges to minimize the impact of the wind field.

This study is supported by the National Natural Science Foundation of China (No. 91647203, 91647111, 41330854 and 41371063) and the Science Foundation of Nanjing Hydraulic Research Institute (No. Y516027, Y516032 and Y517016).