Soil moisture behavior in an experimental basin in Northeast of brazil – the case of Guaraira river basin

Geraldo Moura Ramos Filho, Cristiano das Neves Almeida, and Emerson da Silva Freitas
Federal University of Paraíba, João Pessoa, Brazil (almeida74br@yahoo.com.br)

In 2003, a hydrological network of the semiarid region (REHISA in Portuguese) was created in Brazil. Since then, experimental watersheds in this region have been providing hydro meteorological data collected in automatic gauges. One of these basins is the Guaraíra river basin, which is operated and maintained by the Federal University of Paraíba.

This experimental watershed is located in the coastal region of Paraíba state, where the average annual rainfall is 1.700 mm. According to Köppen its climate is tropical with dry summer, and the drainage area is 5,84 km^2. At this experimental basin four rainfall and one climate gauges were installed in 2003. In all of these gauges the soil moisture is monitored hourly with a Time Domain Reflectometry probe representing the 30 cm layer. According to previous analysis the spatial distribution of rainfall in the experimental basin is very low and also soil texture, which is sandy. However, the land use is different and the behavior of the soil moisture is also different.

Thus, this paper present part of a study that tries to understand the difference between two gauges, in terms of soil moisture. In order to do this, two years data base were used of different gauges, gauges 2 and 4. In the first part of the study, just the descendent part of the soil moisture curve were used. Different data periods were select from a peak to a stabilization point and then the soil moisture Drying Rate (DR) was calculated to show the speed that a peak reaches the stabilization point. The data analysis was carried out considering the whole data together, then the data were shared into dry and wet periods.

The results show that for the gauge 2 the DR range from 0.0335 to 2.772x10-3 kg/kg.h, with an average of 0.632x10-3 kg/kg.h. On the other hand, the gauge 4 present values that range from 0.0139 to 3.617x10-3 kg/kg.h, with an average of 0.375x10-3 kg/kg.h. As can be seen, both gauges presented different DR. When the data set is share into dry and wet period, it was found for both gauges that an exponential equation fits the dry period with determination coefficient equal to 0.68 for gauge 2 and 0.91 for gauge 4. However, for wet period it was not found a representative determination coefficient. The conclusions highlighted that in fact the soil moisture behavior is different in these gauges. Further studies will be carried to evaluate if this difference is related to the groundwater table or to the land use.