Influence of Topography on Water Balance in the Lagoa Santa Karst Region, Minas Gerais-Brazil

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The water balance is an important instrument for measuring the variation of water storage in an area, where it is given by the difference between the inflows and outflows of water. The main entry is through precipitation and exits through evapotranspiration, runoff and deep drainage. There are numerous practical problems in safely measuring or estimating these parameters. In the literature, there are authors who claim that mostly the underground flow in the karst areas is independent of the topography. In the area of study where evapotranspiration was estimated at 77%, and where only 12% of the precipitation recharges the aquifer, a relevant role of topography was verified. The area of study presents a topography that does not favor the runoff, with 43,15 % presenting a slope ≤ 8%, 53,27% between 8 to 31%, and 3,58% between 31 to 46%. An important fact to note is that without runoff favoring, the main structures that promotes direct infiltration (sinkholes, fractures, shafts, and sometimes dolines, etc.) lose their importance when compared to other karst areas. Being the geological structures that offer direct aquifer recharge identified only where there are limestone outcrops in the area of study, diffuse infiltration starts to play an important role in measuring the water balance. The soils found in the area of study are thick, very clayey, and associated with low slope, high precipitation and temperature (factors that are characteristics of the humid tropical environment) favor high evapotranspiration, as an output parameter of the system in the water balance and is directly affected by the topography, thus partially contradicting what is observed in the literature. Therefore, this study demonstrates the extreme heterogeneity that karst areas present, where specific studies must be taken into account mainly in countries belonging to the southern hemisphere. Taking into account that the construction of the classical knowledge of karst studies was developed mainly in the northern hemisphere, many observations made in studies carried out in this region have to be considered with great care when analyzed in karst areas of the southern hemisphere due to the local characteristics that the tropical karst from these areas present. The results found in this study exemplify the complexity that the theme presents and direct influence of the topography on the karst water balance of the study of area.

Keywords: water balance, karst, runoff.