



Proposal of Tank Moisture Index to predict floods and droughts in Peixe River watershed, Brazil

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Rio do Peixe watershed, southern Brazil, has suffered natural disasters caused by excess and shortage of rainfall. The watershed was studied in four catchments, at the gauging stations of Rio das Antas (Pe1, 803 km²); Tangara (Pe2, 2,018 km²); Joaçaba (Pe3, 3,708 km²) and Piratuba (Pe4, 5,238 km²), the last corresponding to Rio do Peixe watershed. Daily hydro meteorological data were used for the period 1977 to 2004. The mean values [mm.d⁻¹] of precipitation (P), potential evapotranspiration (ETP), real evapotranspiration (ETR) were 4.70; 2.83; 2.32 (Pe1); 4.83; 2.85; 2.63 (Pe2); 4.93; 2.90; 2.53 (Pe3); 4.95; 2.95; 2.73 (Pe4), respectively. The Tank Model, structured with four vertical reservoirs and twelve parameters, was calibrated to the four catchments and validated for the studied period. The mean daily observed and calculated discharges [mm.d⁻¹] were: 2.38 and 2.43 (Pe1); 2.20 and 2.19 (Pe2); 2.40 and 2.35 (Pe3); 2.22 and 2.18 (Pe4), respectively. The successfulness of the optimization technique was shown using multiples objectives. The Nash-Sutcliffe and logarithmic Nash index were, respectively: 73% and 78% (Pe1); 80% and 83% (Pe2); 88 and 88% (Pe3); 84% and 84% (Pe4). The Tank Moisture Index (TMI) was developed from the Tank Model, considering the daily water storage in reservoirs 1 to 4, with the use of central tendency (average and median) of the entire historical series. TMI (range 0 to 10) was applied to analyze 290 declarations of 'Emergency Situation' and 'Public Calamity State' caused by natural hazards in 25 municipalities in Rio do Peixe watershed, for the period of 1977-2004. The appliance of the median produced higher adjustment compared with the use of the average approach, with TMI reaching 84% for floods, in 161 of water excess decrees, and with 90% for droughts, in 129 decrees of water shortage. TMI (median) and Tank Model calculated discharge have 97% of correlation by 'segmented regression'. The present study showed that Tank Moisture Index, on daily basis, applied to extreme hydrological events, is useful for floods' warnings, and also for droughts duration and severity analyses. TMI, therefore, can be a tool for making decision on watershed management and for natural hazards prevention.