

Evaluation of different methods to estimate daily reference evapotranspiration in ungauged basins in Southern Brazil

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Evapotranspiration is a key process of hydrological cycle and a sole term that links land surface water balance and land surface energy balance. Due to the higher information requirements of the Penman-Monteith method and the existing data uncertainty, simplified empirical methods for calculating potential and actual evapotranspiration are widely used in hydrological models. This is especially important in Brazil, where the monitoring of meteorological data is precarious. In this study were compared different methods for estimating evapotranspiration for Rio Grande do Sul, the Southernmost State of Brazil, aiming to suggest alternatives to the recommended method (Penman-Monteith-FAO 56) for estimate daily reference evapotranspiration (ET₀) when meteorological data is missing or not available. The input dataset included daily and hourly-observed data from conventional and automatic weather stations respectively maintained by the National Weather Institute of Brazil (INMET) from the period of 1 January 2007 to 31 January 2010. Dataset included maximum temperature (T_{max}, °C), minimum temperature (T_{min}, °C), mean relative humidity (%), wind speed at 2 m height (u₂, m s⁻¹), daily solar radiation (Rs, MJ m⁻²) and atmospheric pressure (kPa) that were grouped at daily time-step. Was tested the Food and Agriculture Organization of the United Nations (FAO) Penman-Monteith method (PM) at its full form, against PM assuming missing several variables not normally available in Brazil in order to calculate daily reference ET₀. Missing variables were estimated as suggested in FAO56 publication or from climatological means. Furthermore, PM was also compared against the following simplified empirical methods: Hargreaves-Samani, Priestley-Taylor, Mccloud, McGuiness-Bordne, Romanenko, Radiation-Temperature, Tanner-Pelton. The statistical analysis indicates that even if just T_{min} and T_{max} are available, it is better to use PM estimating missing variables from synthetic data than simplified empirical methods evaluated except for Tanner-Pelton and Priestley-Taylor.