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An entropy based rainfall disaggregation model

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Daily rainfall measurements are often the only available input for performing environmental, climate, hydrological, and water resources analysis. Given that to simulate and forecast many hydrological phenomena the knowledge of space and time variability is need, rainfall disaggregation procedures can be used to overcome the problem of data limitations in terms of temporal resolution. In this paper an entropy approach is presented, in order to disaggregate daily rainfall amounts to hourly level. Entropy theory is suitable to explain and model hydrological phenomena, such as the observed dependence properties of the rainfall occurrence process, including the clustering behavior and persistence. So, first of all an investigation of basic statistical properties (maximum and mean values, variances, skewness, probability and length of dry intervals, and dependence structure of rainfall) is performed for different time scales, ranging from 1 to 24 hours. Then, using the entropy concept, properties like proportion of dry intervals and rain amounts are evaluated. The analysis are performed using a data set of 20 rain gauges from North Lazio Region, in Central Italy, for the years 1993-2008, for which both hourly and daily data are available. Finally, the disaggregated data set are evaluated against the hourly data and the results are discussed.