

## **Modelling wet and dry spells for daily rainfall data series: an application to irrigation management in North-West Italy**

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Rainfall time variability is relevant for agricultural production. The daily time scale is often used in modelling crop and soil water balance. In this work a novel statistical analysis of wet and dry spells is presented, together with an application in an Italian area characterised by a relevant climate spatial variability, due to the presence of both high mountains (e.g.: Mont Blanc) and of the Mediterranean Sea.

Statistical analysis of the sequences of rainy days, wet spells (WS), and that of no-rainy days, dry spells (DS), could be carried out separately (as widely applied in the past) or jointly, by introducing the inter-arrival time (IT), representing the time elapsed between two subsequent rainy days. Investigating on daily rainfall data series recorded in Sicily, Agnese et al. (2014) found that IT statistics can be described by the 3-parameter Lerch distribution; in turn, WS and DS distributions can be easily derived from IT distribution.

Alternatively, the knowledge of both WS and DS distributions allow deriving IT distribution; in this case, WS can be described by the well-accepted geometric distribution, whereas the 2-parameter polylogarithm distribution can be used for DS, as recently suggested (Agnese et al., 2012) in place of the previously used 1-parameter logarithmic distribution (Chatfield, 1966).

In this work, by using some daily rainfall data series recorded in Alpine and Sub-Alpine Areas, the equivalence between the above-mentioned approaches is showed. Furthermore, some interesting relationships between respective parameters are also illustrated.

A simple soil water model is then used, using this rainfall statistical model, in order to evaluate the irrigation efficiency as a consequence of variations in the timing of surface irrigation, following the approach described in the paper of Canone et al. (2015).

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