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Monitoring and modelling drainage network dynamics of a Mediterranean catchment

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Empirical evidence indicates that the active part of the drainage networks, i.e. that characterized by flowing water, is not static but, conversely, it experiences significant expansion/contraction dynamics produced by the interactions between hydrological and climatic variability, morphological features and soil properties in the contributing catchment. The expansion and contraction dynamics of the "wet" component of the river network can be identified in a wide range of climatic conditions, particularly in the headwaters. In these areas, the observed river network dynamics largely depend on the capacity of the upstream drainage area to concentrate surface runoff in channelized sites.

The study presents a research activity carried out in the framework of the European project "DyNET: Dynamical River Networks" (http://www.erc-dynet.it/), specifically aimed at analysing in detail the processes and agents overseeing changes in form and in the length of river networks in a Mediterranean environment. The contribution describes the first results achieved in the southernmost of the basins under investigation in the DyNET project, namely the Turbolo creek catchment (Calabria, Southern Italy). Bi-weekly surveys were conducted in two sub-catchments having a total area of more than 1 km^2, both during the recession (contraction) and reactivation (expansion) phases of the drainage network. The empirical data were used for the validation of a statistical model of the wet network dynamics, designed to estimate the total length of the active network over time. This length was distributed spatially on the river network in an objective way by defining a two-way relationship between active stream length and the Topographic Wetness Index (TWI). The modelling of the network contraction and expansion dynamics was possible using a few meteorological and hydrological variables. The combined use of information on the overall length of the network and the TWI led to a reasonably good representation of the drainage network dynamics over space and time.