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Investigation of changes and trends in Mediterranean river flows

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The flow regime in the Mediterranean intermittent rivers is quite specific due to the temporal variability of precipitation characterized by a succession of drought and flash-flood periods. During the last decades these rivers are experiencing both a long-term accumulation of human modifications (change in land use) and abrupt changes (construction of dams) altering their flow regime. There is also a high confidence that semi-arid areas such as the Mediterranean basin will suffer a decrease in water resources because of reduction in precipitation and an increase of heat waves (IPCC 2007). Nevertheless, until now this particular regime, which is altered due to human modifications and/or climate changes, and its trend are vaguely known.

The task of this study was to characterize the flow regime for a large number of Mediterranean intermittent streams using several hydrological indexes such as the Richards-Baker Flashiness Index (Baker et al., 2004) and the Aridity Index. These indexes were correlated to the watershed characteristics and to each others. The studied rivers present a considerable inter-annual variation in the R-B Flashiness index. In the southern Mediterranean area, the rivers assume higher values of R-B Index than those located in the northern area. Streams draining small watersheds show a very flashy character, indicating a very quick response to rainfall.

In order to examine the shift in flow regime due to an abrupt change (dams construction), the Richter et al.'s (1996) Indicators of Hydrologic Alteration (IHA) software was used. By dividing the streamflow record into a pre- and post-impact period, the program calculates the percentage change in several ecologically relevant statistics, including magnitude of monthly water conditions, magnitude and duration of annual extreme water conditions, timing of annual extreme water conditions, and frequency and duration of high and low pulses (Gibson et al., 2005).

Finally, long term trends in annual stream flow data was evaluated using non-parametric Mann-Kendall test. Trends in annual precipitation for the selected catchments are also evaluated during the period of record.