

Last century rainfall variations in northern Tuscany (Italy) and possible effects on karstic strategic groundwater.

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Climate change is one of the main factors affecting groundwater resources, making an assessment necessary for the future exploitation. Recent past climate changes evaluation requires an extensive and distributed meteorological database.

Some of the principal groundwater systems in Tuscany (particularly the karst aquifer systems of the Apuan Alps) are present in its northern part. Also, Tuscany has a densely distributed rain gauges network (some datasets longer than 100 years).

Bartolini et al. (2014) and D'Oria et al. (2017) already identified precipitation reduction and temperature increase in the whole of Tuscany and its northern portion for the last century.

In this work, we investigate the time evolution of rainfall in northern Tuscany in the last century both for quantity and dynamics.

The number of rain gauges chosen for this analysis was heavily increased and deeply controlled for datasets continuity and homogeneity.

We studied the precipitation data in terms of mean annual precipitation differences between the periods 1990/2019 – 1921/1950 and 1990/2019 – 1951/1980; detection of trends in the yearly and seasonal precipitation via the Mann-Kendall test; rainfall events variations; spatial distribution of the precipitation trend; changing in single precipitation events extension through the last seventy years. The precipitation reduction, identified in the previous studies, is confirmed and seasonally featured. We highlight variations in the rainfall events for different rain-depth intervals. We estimate the last century annual precipitation decrease to be around 10% of the Mean Annual Precipitation in the past thirty years. However, this variation seems not evenly distributed in the analysed area.

The observed evolution in local hydrological regime represents a serious threat to the strategic karst groundwater of the area, which is sensitive to hydro-climate conditions (Doveri et al., 2019). The precipitation decrease and the change in distribution are already modifying the flow rate and regime in some major karst springs.

Main references:

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