Geophysical Research Abstracts
Vol. 16, EGU2014-9933, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

On the decrease of water resources during the last decades in the Flumendosa basin, Sardinia.

Roberto Corona (1), Nicola Montaldo (1), and John D. Albertson (2)

(1) Cagliari, Ingegneria, Ingegneria del Territorio, Italy (roberto.corona@unica.it), (2) Department of Civil and Environmental Engineering, Pratt School of Engineering, Duke University

The Mediterranean climate is characterized by a cool and wet winter and a hot and dry summer. In these climate ecosystems during the winter months much of the precipitation recharges sub-surface and surface reservoirs. However, in the late winter and early spring, when vegetation growth conditions are favorable, much of the precipitation can be depleted by transpiration and, furthermore, runoff reduced directly by the increased vegetation cover. A common feature of the Mediterranean region is the evident effect of climate changes that it is causing several problems on the water resources availability. Brunetti et al. (2000) and Dunkeloh and Jacobeit (2003) have shown a strong decreasing trend in winter precipitation amounts over much of the Mediterranean for the past several decades. Additionally, there is evidence of shifts in how the precipitation is distributed across the winter and spring months. Considering that the most of the runoff to surface reservoirs occurs in the winter months and that spring hydrologic response is likely to be influenced strongly by vegetation (depending on overlap between rainy- and growing-seasons) these precipitation changes can be considered hydrologically important. Case study is the Flumendosa basin (Sardinia, basin area of about 1700 km2), which is characterized by a reservoir system that supplies water to the main city of Sardinia, Cagliari. Data are from 42 rain gauges stations (1922-2008 period) over the entire basin and data of runoff are available for the same period. Interestingly in the Flumendosa reservoir system the average annual input from stream discharge in the latter part of the 20th century was less than half the historic average rate, while the precipitation over the Flumendosa basin has decreased, but not at such a drastic rate as the discharge, suggesting a marked non-linear response of discharge to precipitation changes. Trends in precipitation series were examined using the Mann-Kendall non-parametric trend test, which shows a sequence of alternating decreasing and increasing trends in monthly precipitation, statistically significant. In autumn and winter months rains are decreasing, while an increase of monthly precipitation is estimated in the spring and summer months. The analysis of the mean seasonal precipitation climatology confirms the same behavior, highlighting a clear change of the rain regime after 1980. Hence, in late 30 years the rain decreased during the winter months (i.e. less recharges to the reservoirs), and increases during spring and summer months, when the evapotraspiration is higher (i.e. recharges to the reservoirs doesn't increase). Interestingly we found differences of rain between the mountain and the down plane area of the basin: in the mountain area of the Flumendosa basin there is a strong positive trend, i.e. an increase, of the number of wet days of the winter months only for the highest rain intensity (> 50 mm/d), in contrast with the other part of the basin and the lower rain intensities. Hence, the results highlight an increase of floods only for the mountain part of the basin during the winter months due to the increase of the frequency of the highest rain intensities; while at the whole basin scale the rainfall trend is negative for the winter months, so that runoff decreased in the most important period of the year for reservoir recharge.