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Looking at hydrological variability in a Mediterranean mountain area to infer potential effects of climate change on water resources

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According to the last IPCC report (2007), the Mediterranean area is one of the areas of the Earth more vulnerable to climate change. In Catalunya a recent work based on results obtained within the IPCC's Fourth Assessment Report, anticipates an increase in temperature, bounded between 1.5ºC and 6ºC with an average value of 3.5°C by the end of the 21st century. For precipitation, despite the wide dispersion of the results, a decrease around 25% by end of the 21st century is foreseen.
From a hydrological point of view, the implications of climate change on Mediterranean water resources are difficult to assess, and are always surrounded by a high degree of uncertainty. The analysis of detailed hydrological data sets may provide a simple but effective way to explore the inter/intra annual variability of the hydrology of Mediterranean areas; and because inter/intra annual variations of temperature and precipitation are marked in Mediterranean areas (often much more than those foreseen by climate change models in the case of precipitation), a better understanding of the variability of the hydrology of Mediterranean areas, may be seen as a possible way to evaluate potential effects of climate change on water resources.
The objective of this work is to investigate the inter/intra annual variability of the hydrological response of a Mediterranean mountain area using the detailed hydrological data set gathered in the Vallcebre Research catchments (North Eastern Spain) in the last 16 years.
During this period mean annual temperature showed deviations from -0.6ºC to +1.0ºC and mean annual precipitation from -33% to +49%. At seasonal scale, larger differences were observed; over the period, mean seasonal temperature showed a range of variation higher than 3.0ºC for all seasons, and mean seasonal precipitation varied from -95% to more than+200% with respect to the mean seasonal value.
The effect of this inter/intra annual variability of temperature and precipitation on the observed runoff at the catchment scale was major, with observed annual runoff value ranging from 34 to 816 mm (i.e. variations from -89% to +170% with respect to the mean). At the season scale, variations of the observed runoff were larger (-95% to +390%). The effect on the soil saturated store was also important. During the period considered, the mean depth to the water table presented variations from -54cm to +70cm between years, and from -127cm to +145cm at the season scale. Finally, soil water content variations (0-20cm and 0-80cm depth) ranged from -21% to 15% between years and from -35% to 45% at the season scale.
The detailed hydrological data set is currently being analysed, in order to provide a global assessment of the effect of dry/hot periods on the hydrological response of Mediterranean mountain areas.