AvH6-52, 2010
6th Alexander von Humboldt International Conference
© Author(s) 2009

Interactions between climate change, hydrology and soil erosion in different climatic zones in Italy

A. Capra (1) and D. Pavanelli (2)

(1) Department of Agro-forestry end Environmental Sciences and Technologies, Mediterranean University of Reggio Calabria - Italy, (2) Bologna University, Department of Earth Sciences and Environment, Bologna, Italy (donatella.pavanelli@unibo.it)

In Italy, during last century the mean annual temperature (Tym) increased by 0.4°C/100 years in Northern areas (N) (continental zone) and by 0.7°C/100 years in Central (C) and Southern (S) parts (peninsular zones). A negative trend of annual rainfall (Py) was evident in both N and S areas. Extreme events had different tendencies, corresponding to increases in rainfall intensity and in drought conditions in both N and S areas. Climate change affects both vegetation water availability and runoff and erosion. Different results on climatic trends were obtained for smaller sub-regions of Southern Italy. Therefore, climate change studies at a regional level should also account for geographical factors (e.g. distance from the sea, elevation, aspect).
In the current study trend in precipitation recorded during last century in three different climatic zones in Italy were investigated and compared. The three zones are: a typical Tuscan-Emilian Apennines watershed (the Reno river) located in the continental area, the Calabria region located in the peninsular zone, and the Sicily region, an island located in the South of Italy.
For Reno river mountain watershed (2.597 km2), an attempt was made to gain some knowledge about the changes in the 20th century of the land use and of the climate, connected to the erosion soil risk. The Italian Apennines, from the 16th century, were exploited for farming and for agro forestry and pastoral activities. This human activities encouraged intense erosive processes, but an important factor controlling the intense morphodynamics is the contemporary increase of rainfall in the “Little Ice Age”. From the beginning of the 1900, have been led two conflicting and simultaneous phenomena: population moving both to cities and valley bottoms and agricultural mechanization. Their consequences have been evident on land use: abandonment of unproductive fields, of forestry practices and enlargement of the remaining plots.
The Calabria region is a long narrow peninsula extending for about 250 km North to South. A mountain range (the Apennines) running perpendicularly to the dominant moisture-bearing wind direction, causes rainfall and temperature variability dividing the region into two different areas: the Tyrrhenian and Ionian. Bioclimatic parameters, such as evapotranspiration, rain deficit and aridity index, and drought characteristics have been analysed to check the climate change effects on vegetation.
Sicily is the largest island of the Mediterranean Sea. According to traditional geographical distinctions for making sub-regional analysis, Sicily was divided into three homogeneous sub-regions (North, East, and South). Each sub-region is separated from the others by mountain ranges and for this reason the rainfall pattern is different from area to area. Because of its particular geographic location in the centre of the Mediterranean Sea, Sicily was often investigated as a key region in order to explain the climate evolution within the Mediterranean basin. The measures on ephemeral gully erosion conducted in the small catchment of Raddusa permit some considerations on climate change response.
The overall results showed the importance of the climate change analyses at a regional scale. The analysis carried out showed an increase of temperature (ranging from 0.1 and 2.2°C/100 years for the mean annual temperature) and a decrease of precipitation (ranging from 153 to 344 mm/100 years for the annual rainfall) over the two investigated regions located in South Italy (Calabria and Sisily). In the North Apennines Reno watershed the mean precipitation during 1926-2006 was 1315 mm, with a decrease of precipitation about 7% during the last period 1976-2006. In the same period the river water flow decreased of about 22% (Casalecchio gauge) referring to the 1926-2006 (average outflow of 705 mm). The temperature increased over 0,4°C with consequent decrease of the snow and frost.
The calculated values of evapotranspiration ET0, which accounted for mean (Ta), maximum (Tmax) and minimum (Tmin) values of temperature, showed different trend respect to the temperature because Tmax and Tmin did not

increase with the same magnitude.
The aridity conditions are not encouraging during the analysed period: the calculated Aridity Index showed values which tend to decrease.
Climatic variability increased as a consequence of global climate change, resulting in greater frequency and intensity of extreme weather events, which increases drought intensity and erosion.