Geophysical Research Abstracts, Vol. 9, 10669, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10669

Interannual variability of soil moisture: detailed measurements and ecohydrological models simulations.

S. Ferraris, D. Canone, M. Previati, F. Calderon, L. Salvai, I. Bevilacqua

Dipartimento di Economia e Ingegneria Agraria, Forestale e Ambientale, Università di Torino,

(e-mail: stefano.ferraris@unito.it , Ph. +39 011 6708616, Fax +39 011 6708619)

In the present work four northern Italy daily data series of rainfall and temperature were used. They were chosen because minor changes in land use have been occurred during the concerned periods. The longest one started from the year 1925. The shortest one starts from the year 1997, but reported also the soil water data from the monitoring station located in the campus of the Agricultural Faculty of Torino. This station is composed by an automatic meteorological station, an automatic TDR station with 160 vertical probes having length ranging from 150 mm to 2000 mm, and 160 non-automatic tensiometers.

In the study a comparison between the results from the eco-hydrological models proposed by Rodriguez- Iturbe *et al.*(1999), Milly (2001), Laio *et al.*(2001), was performed. The first model shows a tendency to underestimate the soil water content in dry condition (θ <0.15 m^3/m^3) and fine texture; the second model has a low sensibility to small changes in meteorological parameters, while the third model gives good results, but it's quite time consuming if a large number of soil water content have to be calculate. The validation of the models, by comparison of results with real soil water content measured by the monitoring station, shows a general tendency to underestimate the true soil water content. The underestimation range from 1 to 12 percentage points. The cause of underestimation can be the nonstationarity of the soil water content: in fact at the beginning of the growing season it is usually much higher than at the end. At the present time a further study is in progress with a model of Laio *et al.* (2002), which take into account the seasonal dynamics of the climatic parameters during the growing season.

Its use will also complete the evaluation of the importance of bimodality in the water

content probability density. In fact, for the time being, we run the three mentioned models showed that bimodality only occurs when high soil depth are employed. Yet, the bimodality shows dependency from the coefficient of variation of depth of rainfall parameters.

The evaluation of climate changes, through the analysis of meteorological data series and the water content obtained by the models, shows a tendency to reduction of depth of rainfall and an increase of the rainfall frequency until the year 1980, meanwhile the simulated soil water content seems quite stable in the average along the whole period. The data analysis of the period lasting from 1940 to 2005, in which there are data from two of the meteorological stations, showed quite similar trends in rainfall depth, rainfall frequency and bimodality.

Meanwhile the longest series analysis (80 years) didn’t show remarkable changes of soil water content during the long period. On the other hand, the analysis of the great amount of data, collected by soil water content monitoring station during the last decade, shows a remarkable interannual meteorological variability and a progressive drying up to the deep soil at an interannual scale.