

Changes in precipitation, runoff and sediment transport in the Eastern Romania during the period 1950 to 2010

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In this paper are analyzed the climatic and hydrological records from 29 meteorological stations and 48 hydro-metric stations which are all overlapping on two big drainage basins (Siret and Prut) from the eastern part of Romania. To these registrations, were added information obtained on basis of more than 20 dendrochronological series collected from the entire surface of the two studied basins. In order to obtain the correlation between radial tree rings growth and climate, were used the climatic data from National Climatic Grid with spatial resolution of 10x10 km. The climatic information obtained on the analysis of dendrochronological series complete the data from the meteorological stations, especially if we consider the fact that some of the tree ages cover older periods than year 1900.

Annual series of variables: temperature (T), precipitation (P), number of days from year with sunshine radiation (S) water discharge (Qw), suspended sediments (Qs) cover the time interval 1950-2010. These constitute in a well-known cascade type process of influence transmission: precipitations determine runoff which, in turn, determines erosion. The last variable from this chain – in channel transported sediments and their movement from source to delivery represents a key issue of dynamic geomorphology. The rhythm in which this process occurs may change dramatically, representing the signal of great changes in landform domain (climate changes or human interventions).

Climatic, hydrological, dendrochronological time series analysis has the goal the answer the following questions: Which is the spatial variability of these series behavior? Can we identify areas with similar features of series? What factors “complicated” the cascade transmission of $P \rightarrow Qw \rightarrow Qs$ variability? Can we identify common thresholds in series change and which are the causes? In Natural vs. Human competition, can we quantify their weight for considered series in the shown geographic space?

Using dendrochronological analysis we will establish years with exceptional hydrological events prior to years with instrumental registrations. The obtained data will be modeled considering the known data in order to reconstruct water discharge (Q), suspended sediments (Qs)

This application was elaborated for Eastern part of Romania, covered by the hydrographic basins of Siret and Prut, respectively for an area of more than 43000 km². The conditions for geological structure, relief, land use, etc. offers the potential to better understand the spatial variability of some natural processes behavior in the last 6 decades. Also, a number of human interventions have occurred within the Siret and Prut River’s drainage basins (i.e. dam construction, channelization, sediment mining, and deforestation), primarily during the past century. The history of human interventions in the area began during the twentieth century with the construction of bank protection structures, especially following the catastrophic 1970–1975 flood events. Natural reforestation, which followed several centuries of intense deforestation, has been most intense from the 1950s onward.