



On the estimation of the design flood of the Rio Mogoro dam in Sardinia

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The problem of the hydraulic safety of existing dams is becoming crucial due to the recent increase of floods. In Sardinia dams were built for both electric production and water supply for irrigation and civil uses during the 1920-1960 period. Recent floods showed a significant increase in magnitude and frequency, supporting the hypothesis of a hydrologic climate change. Are the existing dams still safe?

For answering the question 1) an hydrologic model is implemented and widely tested with historical floods, 2) a method for estimating the flood hydrograph with return period of 1000 years and 3) the hydraulic safety of existing dams is tested.

The case study is the Rio Mogoro river basin (area of about 255 km²) located in central-western Sardinia (Italy). The gravity dam was built in 1934 with a volume of 11.31 million of cubic meter.

In the first part of this work the rainfall and discharge data of historical floods were acquired so that a fully evaluation of the hydrologic model has been performed. The distributed hydrologic model is an event model (FEST) which assesses runoff through a simplified approach based on Soil Conservation Service equations and runoff propagation through the Muskingum-Cunge approach.

Then the design flood of return period of 1000 years is estimated using a synthetic design hyetograph and FEST. For estimating and checking hydrograph characteristics statistics on observed flood hydrographs (i.e. local statistics) were evaluated: the peak flow, the time and duration of the peak and the volume of the flood. Local statistics are further compared with regionalized statistical methods for flood predictions. In this way synthetic hyetograph and hydrograph are estimated for the design flood of return period of 1000 years.

The results show that the flood increases with the position of the peak of the hydrograph due to the soil saturation; the time peaks of the hydrograph and of the flood hydrograph are different: it depends on the propagation in the channel and on the soil permeability.

In the last part of the work we use the hydrograph flood of the project calibrated to verify the safety of the dam for a return period of 1000 years. From these analysis the dam of Mogoro will be overflowed by a rain with a return period of 30 years.