Geophysical Research Abstracts,
Vol. 11, EGU2009-12624, 2009
EGU General Assembly 2009

Hydrologic climate change: are the existing dams still safe? The Flumendosa case study in Sardinia

G. MACCIONI, N. MONTALDO, and A. SABA
Dipartimento di Ingegneria del Territorio, Università di Cagliari, Italy (maccionigiovanni@libero.it)

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) a method for estimating the flood hydrograph with return period of 2000 years also accounting for possible climate change is developed, 2) an hydrologic model is implemented, and 3) the hydraulic safety of existing dams is tested. The case study is the Flumendosa river basin (area of about 1300 km2) located in central-eastern Sardinia (Italy), whose reservoir system (3 dams) is the main water supply of southern Sardinia, including its largest city, Cagliari. The smallest dam is located in the upper part of the basin with a drainage area of about 50 km2. At this dam, during the December 2004 flood an extremely high peak discharge of around 2000 m3/s was observed (total daily rain was of 600 mm). In the basin the soils are generally of modest thickness, the vegetation throughout the basin has been in part altered by human activities, with many areas (before covered by scrubs) converted to pasture. Urbanized areas are a minor component. Rainfall and discharge data of historical floods (from 1940) 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. The FEST model well simulates historical and recent floods. The results demonstrated that the dams are not safe for the estimated flood with return period of 2000 year, but also demonstrated the extreme uncertainty in the estimate of floods with extremely high return period. The proposed method is able to include this uncertainty.