ABSTRACT

The dams provide many benefits for our society (water, irrigated land, lamination of avenues, electrical energy) but the floods that result from the break of the dams constructed also have produced some of the most devastating disasters of last two centuries.

For the study of the breaking concrete dams and displacement of the wave of rise produced by such turning, the mathematical modeling is the option more employed in the present for the obtaining of water depths and speeds for the valley of flood.

For sake of analysis, three different mathematical models are studied here:

- The DAMBRK, a classical parametrical model for dam break and developed by the National Weather Service (NWS), used to develop the outflow hydrograph from a dam and hydraulically (using the complete one-dimensional Saint Venant equations) route the flood through the downstream valley.

- The HEC-RAS, model developed by the US Army Corps of Engineers, used to simulate the one-dimensional displacement of flows for channels ramified and that at the same time "ArcView", the GIS software, can interact with it through its extension HEC-GeoRAS, that is useful for the obtaining of the geometry of the problem from a digital model of the terrain (TIN).

- The CARPA, an hydraulic tool for the numerical simulation of free surface unsteady water flow developed by Flumen research group of the Civil Engineering School of Barcelona (Universitat Politècnica de Catalunya).

These three models are compared to study the Talarn dam´s possible failure, placed upstream the population of Tremp (Pallars Jussà, Catalonia), and the displacement of the consequent wave of rise produced by the valley of waters downstream. In order to nourish the three models and evaluate their results, the information about flows and levels of the dam is proportionate by the company ENDESA.

The results obtained through the simulation of the dams breaking have to be shown by a sensitivity analysis, where they are carried out by modify simulations according to the different failure hypotheses, this way a better interpretation of the results can be made through the knowledge of the behaviour of the used models.

Finally, one of the most relevant conclusions that they are extracted in this study is that the DAMBRK, more used program from it makes varying years for studies of dams break, is coming off phased out in front the utility of the the HEC-RAS with the application HEC-GeoRAs. Even though the results at level of calculation are quite similar, since both softwares work with the same outline of one-dimensional calculation, the senior speed and quality of the proportionate results for the HEC-RAS (maps with stains of flood, maps with distribution of speeds...) make that the difference is remarkable regarding innovation and presentation of results.

CARPA, for his part, gives much more adjusted results to the reality since it allows to replay the two-dimensional nature of the sheet of water and to reveal the presence of hydraulic phenomena, like the crossed waves for example, that they are impossible to appreciate with the one-dimensional models. However, the processes of obtaining the results can manage to last a little more than the one-dimensional models.