

EXPERIMENTAL STUDY OF YIELD STRESS RELATED WITH MUD AND DEBRIS FLOW COMPUTING

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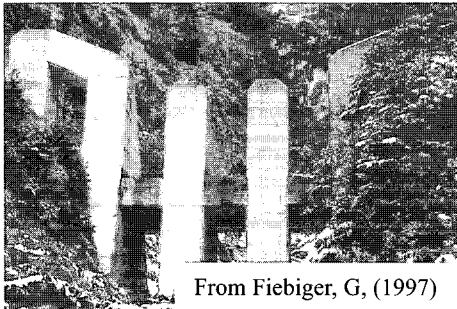
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Abstract

Rheological behavior of mud and debris flow acquire importance in numeric modeling this events which have produced as main damages, human life and economic losses, in several places in the world and specifically in Mexico have been more the events occurred in the last years.

Owing the high sediment concentrations in the mixtures, exceed in several magnitude orders, the values usually observed for rivers, yet for large floods, it is necessary take account the influence of this parameter that have influence in a direct way in the mixture viscosity and the solid particles falling velocity.

Size and design of protection works is so different with regard the related for lower sediment concentrations as used in fluvial hydraulics; the structures are thicker, stronger and more resistant given the features of the water-sediment mixtures. An example of the structures mentioned is shown in Fig. 1.



From Fiebiger, G, (1997)

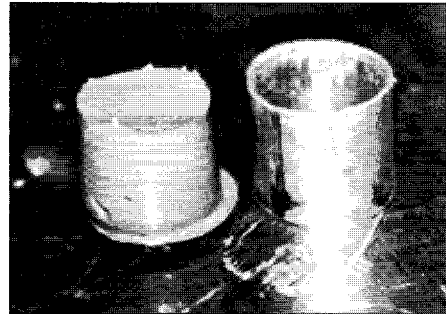


Fig. 2 Cooper rheometer and a sample appearance

Fig. 1 Protection Works in Austrian Alps appearance

In Mexico, there are not references about mixtures water-sediments rheological studies for applying in natural mud and debris flows. For applying any simulation model it would be necessary use the values recommended in the related literature. Nevertheless, reported values are obtained for soil mixtures of a particular site and the conditions may vary in a significant way from the corresponding a interest area where is required to evaluate this flows occurrence.

Therefore, it is necessary to dispose a methodology for estimating rheological parameters for conditions of Mexico.

Experimental tests were carried out in the Mexican Institute for Water Technology, IMTA for natural water-clay and water-clay-fine sand samples with concentrations higher than 14 % by weight for getting the yield stress adapting the method proposed for Pashias

which is useful, simple and practical.

We got relations concentration-yield stress that can be used in numerical simulation models for computing the performance of this flows in Mexico areas with similar features sediments.

Values and tendency functions got are accord with reported in corresponding literature usually referred to works where are used sophisticated and expensive equipments.

Experiments were done using a cylindrical pipe, without covers in its bases, put on a flat base that for thus case was an acrylic plate, Fig.2, the cylinder was full until the maximum level in a way the surface be flat and horizontal; the cylinder was taken away, allowing the sample slump and then, measuring the displacement or slump.

Concentrations tested are in Fig.3 where Also are included as a reference, Major and Pearson, (1992). Yield stress was approximated a power function of volumetric concentration for two series with acceptable correlation.

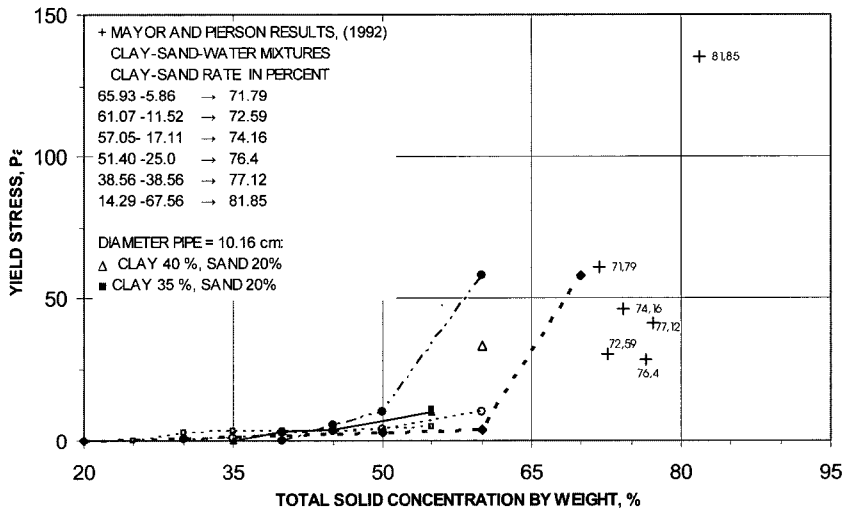


Fig. 3 Combination tested and results

Based in the works here described, it is disposed a methodology for obtaining the yield stress in an practical, economical and no complicated way.

The method proposed by Pashias and Boger is economic and relatively simple for applying. According with the developing of works, it can be adapted for field conditions to samples recently collected that in other way would be necessary to move to laboratory for measuring this mixture parameter.