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Tailings dam-break flow – Analysis of sediment transport

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A common solution to store mining debris is to build tailings dams near the mining site. These dams are usually built with local materials such as mining debris and are more vulnerable than concrete dams (Rico et al. 2008). of The tailings and the pond water generally contain heavy metals and various toxic chemicals used in ore extraction. Thus, the release of tailings due to a dam-break can have severe ecological consequences in the environment. A tailings dam-break has many similarities with a common dam-break flow. It is highly transient and can be severely descructive. However, a significant difference is that the released sediment-water mixture will behave as a non-Newtonian flow. Existing numerical models used to simulate dam-break flows do not represent correctly the non-Newtonian behavior of tailings under a dam-break flow and may lead to unrealistic and incorrect results. The need for experiments to extract both qualitative and quantitative information regarding these flows is therefore real and actual. The present paper explores an existing experimental data base presented in Aleixo et al. (2014a,b) to further characterize the sediment transport under conditions of a severe transient flow and to extract quantitative information regarding sediment flow rate, sediment velocity, sediment-sediment interactions a among others. Different features of the flow are also described and analyzed in detail. The analysis is made by means of imaging techniques such as Particle Image Velocimetry and Particle Tracking Velocimetry that allow extracting not only the velocity field but the Lagrangian description of the sediments as well. An analysis of the results is presented and the limitations of the presented experimental approach are discussed.

References

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