Numerical investigation of meso-scale structures using a two fluid model with non-Newtonian closure JOSÉ MIGUEL PEREZ, ALFREDO PINELLI, CIEMAT, Combustion & Gasification Division, Madrid — The idea is based on identifying the physical roles of the solid and fluid stress tensors in the solid phase momentum equation. The tensors are reformulated as a sum of different terms. A comparison with the closure proposed by Marchioro et al. (Int. J. Multiphase flow. 27: 237-276, 2001), leads to a new non-Newtonian closure. The complete model has been tested with two different scenarios. First, we used an initial Taylor-Green base flow for the fluid phase with a highly diluted regime with mass fraction of order one. This case allows for a critical evaluation of the present formulation vs Saffman's 1962. We also considered a base channel flow with solid particles. Different regimes (solid fractions) have been considered. The results are compared vs Agrawal et al. (J. Fluid Mech. 445: 151-185, 2001) in terms of of meso-scale solid structures behaviours. The numerical discretization for both phases is based on a finite volume formulation using a Rusanov scheme for the hyperbolic part of the equations that preserves the positivity of the void fraction.

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