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**Simple realization of non-local granular fluidity rheology based on finite volume method solver** DORIAN FAROUX, KIMIAKI WASHINO, TAKUYA TSUJI, TOSHITSUGU TANAKA, Osaka Univ — Despite the ubiquity of granular materials in industries and natural phenomena, the modeling of dense granular flows whose behavior is at the frontier between solids and liquids and has yet to reach a consensus. Local theories like the popular $\mu(I)$ rheology has been successfully applied to a wide range of applications but fail to capture the influence of grain interaction on a mesoscopic level such as smooth transition between a jamming and a flowing state or various grain size-dependent effects. One of the non-local models proposed to address those shortcomings is the non-local granular fluidity (NGF) introduced by Kamrin  Koval (2012). While the model has been validated against several reference cases and has been given a finite element method formulation, it has yet to be used with other type of computational fluid dynamics (CFD) solvers. In order to ease the use of non-local simulations and deepen our knowledge regarding the abilities and limitations of the NGF model, we propose a simple realization of the NGF rheology within the finite volume method (FVM) framework using a standard incompressible Navier-Stokes solver. We then compare our results and find good agreement with both experiments and FEM data for several geometries including planar and annular shear flows.

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