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Well-posed continuum equations for granular flow with compressibility and $\mu(I)$ -rheology THOMAS BARKER, The University of Manchester, DAVID SCHAEFFER, Duke University, MICHAEL SHEARER, North Carolina State University, NICO GRAY, The University of Manchester — Continuum modelling of granular flow has been plagued with the issue of ill-posed equations for a long time. Equations for incompressible, two-dimensional flow based on the Coulomb friction law are ill-posed regardless of the deformation, whereas the rate-dependent $\mu(I)$ -rheology is ill-posed when the non-dimensional strain-rate I is too high or too low. Here, incorporating ideas from Critical-State Soil Mechanics, we derive conditions for well-posedness of PDEs that combine compressibility with I -dependent rheology. When the I -dependence comes from a specific friction coefficient $\mu(I)$, our results show that, with compressibility, the equations are well-posed for all deformation rates provided that $\mu(I)$ satisfies certain minimal, physically natural, inequalities.

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