Non-affine velocity fields to explain weakly-nonlinear rheology
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bana Champaign — We derive and interpret the weakly nonlinear response of the
Johnson-Segalman/Gordon-Schowalter constitutive model for non-Newtonian flu-
ids. Non-affine "slip" velocity fields cause the nonlinearity in this family of models.
From our theoretical derivation, we show how quantitative medium-amplitude os-
cillatory shear (MAOS) nonlinearities can be associated with these material-level
flow physics. Other constitutive models are a subset of the generalized results pre-
sented here, including the generalized Corotational Maxwell model. We derive
results for a generalized relaxation kernel allowing for complex relaxation spec-
tra, enabling us to reinterpret previously published MAOS experimental data in
terms of non-affine flow and deformation. Reference: Ramlawi, N., N. A. Bharad-
waj, and R. H. Ewoldt, “The weakly nonlinear response and non-affine interpreta-
tion of the Johnson-Segalman/Gordon-Schowalter model,” arXiv:2007.08089 [cond-

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