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**Field-sensitivity To Rheological Parameters** JONATHAN FREUND, RANDY EWOLDT, University of Illinois at Urbana-Champaign — We ask this question: where in a flow is a quantity of interest $Q$ quantitatively sensitive to the model parameters $\vec{\theta}$ describing the rheology of the fluid? This field sensitivity is computed via the numerical solution of the adjoint flow equations, as developed to expose the target sensitivity $\delta Q/\delta\vec{\theta}(\mathbf{x})$ via the constraint of satisfying the flow equations. Our primary example is a sphere settling in Carbopol, for which we have experimental data. For this Carreau-model configuration, we simultaneously calculate how much a *local* change in the fluid intrinsic time-scale $\lambda$, limit-viscosities $\eta_o$ and $\eta_\infty$, and exponent $n$ would affect the drag $D$. Such field sensitivities can show where different fluid physics in the model (time scales, elastic versus viscous components, *etc.*) are important for the target observable and generally guide model refinement based on predictive goals. In this case, the computational cost of solving the local sensitivity problem is negligible relative to the flow. The Carreau-fluid/sphere example is illustrative; the utility of field sensitivity is in the design and analysis of less intuitive flows, for which we provide some additional examples.

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