1163-F1-1117   **Laurel A Ohm*** (`laurel.ohm@nyu.edu`). *Accuracy of slender body theory in approximating force exerted by thin fiber on viscous fluid.*

We consider the accuracy of slender body theory in approximating the force exerted by a thin fiber on the surrounding viscous fluid when the fiber velocity is prescribed. We term this the slender body inverse problem, as it is known that slender body theory converges to a well-posed PDE solution when the force is prescribed and the fiber velocity is unknown. From a PDE perspective, the slender body inverse problem is simply the Dirichlet problem for the Stokes equations, but from an approximation perspective, nonlocal slender body theory exhibits high wavenumber instabilities which complicate analysis. Here we consider two methods for regularizing the slender body approximation: spectral truncation and the δ-regularization of Tornberg and Shelley (2004). For a straight, periodic fiber with constant radius $\epsilon > 0$, we explicitly calculate the spectrum of the operator mapping fiber velocity to force for both the PDE and the approximations. For both the truncated and δ-regularized approximations, we obtain convergence results to the PDE solution as $\epsilon \to 0$. Moreover, we determine the dependence of the δ-regularized error estimate on the regularization parameter δ. (Received September 14, 2020)