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Flow interaction with a flexible viscoelastic sheet KOUROSH SHOELE, Florida State University — Many new engineered materials and almost all soft biological tissues are made up of heterogeneous multi-scale components with complex viscoelastic behavior. This implies that their macro constitutive relations cannot be modeled sufficiently with a typical integer-order viscoelastic relation and a more general mode is required. Here, we study the flow-induced vibration of a viscoelastic sheet where a generalized fractional constitutive model is employed to represent the relation between the bending stress and the temporal response of the structure. A new method is proposed for the calculation of the convolution integral inside the fractal model and its computational benefits will be discussed. Using a coupled fluid–structure interaction (FSI) methodology based on the immersed boundary technique, dynamic fluttering modes of the structure as a result of the fluid force will be presented and the role of fractal viscoelasticity on the dynamic of the structure will be shown. Finally, it will be argued how the stress relaxation modifies the flow-induced oscillatory responses of this benchmark problem.

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