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Quasilinear models through the lens of resolvent analysis[1] BEVERLEY MCKEON, California Institute of Technology, GREG CHINI, University of New Hampshire — Quasilinear (QL) and generalized quasilinear (GQL) analyses, e.g. Marston et al. (Phys. Rev. Letters, 2016), also variously described as statistical state dynamics models, e.g., Farrell et al. (J. Fluid Mech., 2016), restricted nonlinear models, e.g. Thomas et al. (Phys. Fluids, 2015), or 2D/3C models, e.g. Gayme et al. (J. Fluid Mech., 2010), have achieved considerable success in recovering the mean velocity profile for a range of turbulent flows. In QL approaches, the portion of the velocity field that can be represented as streamwise constant, i.e. with streamwise wavenumber $k_x = 0$, is fully resolved, while the streamwise-varying dynamics are linearized about the streamwise-constant field; that is, only those nonlinear interactions that drive the streamwise-constant field are retained, and the non-streamwise constant "fluctuation-fluctuation interactions are ignored. Here, we show how these QL approaches can be reformulated in terms of the closed-loop resolvent analysis of McKeon & Sharma (2010), which enables us to identify reasons for their evident success as well as algorithms for their efficient computation.

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