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Representing broad band effects by low order Galerkin models of fluid flows[1] GILEAD TADMOR, Northeastern University, BERND R. NOACK, MICHAEL SCHLEGEL, OLIVER LEHMANN, Berlin Institute of Technology, SCOTT KELLEY, Northeastern University, MAREK MARZYNSKI, Poznan University of Technology — We discuss a system reduction strategy for spectral and Galerkin models of incompressible fluid flows. This approach leads to dynamic models of lower order, based on a partition in slow, dominant and fast modes. In the reduced order models,slow dynamics are incorporated as nonlinear manifold consistent with mean-field theory. Fast dynamics are stochastically treated and can be lumped in eddy viscosity approaches. The employed interaction models between slow, dominant and fast dynamics respect momentum and energy balance equations in a mathematically rigorous manner - unlike unsteady Reynolds-averaged Navier-Stokes models or Smagorinsky-type reductions of the Navier-Stokes equation. The proposed system reduction strategy is employed to the cylinder wake benchmark.

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