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1000-76-197 **Jimmy Fung*** (fung@caltech.edu), Aeronautics 104-44, California Institute of Technology, 1200 E. California Avenue, Pasadena, CA 91125. *Equation-free multiscale computation for compressible fluid flows.* Preliminary report.

We describe a technique for the efficient computation of the dominant-scale dynamics of a fluid system when only a high-fidelity simulation is available. Such a technique is desirable when governing equations for the dominant scales are unavailable, when model reduction is impractical, or when the original high-fidelity computation is expensive. We adopt the coarse analysis framework proposed by I. G. Kevrekidis (2003), where a computational superstructure is designed to use short-time, high-fidelity simulations to extract the dominant features for a multiscale system. We apply this technique to compute the dominant features of the compressible flow through a planar diffuser. We discuss the high-fidelity simulation, the identification of dominant scales, the design of a computational superstructure for time integration of the dominant-scale dynamics, and associated results. The results include accurate short and medium-time tracking of the dominant-scale dynamics for a range of parameter values for the computational superstructure. These results suggest that coarse analysis methods are useful for solving fluid flow problems of a multiscale nature. Finally, we identify numerical stability issues and additional applications. (Received August 24, 2004)