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**Artificial Compressibility with Entropic Damping** JONATHAN CLAUSEN, SCOTT ROBERTS, Sandia National Laboratories — Artificial Compressibility (AC) methods relax the strict incompressibility constraint associated with the incompressible Navier–Stokes equations. Instead, they rely on an artificial equation of state relating pressure and density fluctuations through a numerical Mach number. Such methods are not new: the first AC methods date back to Chorin (1967). More recent applications can be found in the lattice-Boltzmann method, which is a kinetic/mesoscopic method that converges to an AC form of the Navier–Stokes equations. With computing hardware trending towards massively parallel architectures in order to achieve high computational throughput, AC style methods have become attractive due to their local information propagation and concomitant parallelizable algorithms. In this work, we examine a damped form of AC in the context of finite-difference and finite-element methods, with a focus on achieving time-accurate simulations. Also, we comment on the scalability of the various algorithms. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Jonathan Clausen
Sandia National Laboratories

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