Abstract Submitted
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Fully explicit algorithms for fluid simulation JONATHAN CLAUSEN, Sandia National Laboratories — Computing hardware is trending towards distributed, massively parallel architectures in order to achieve high computational throughput. For example, Intrepid at Argonne uses 163,840 cores, and next generation machines, such as Sequoia at Lawrence Livermore, will use over one million cores. Harnessing the increasingly parallel nature of computational resources will require algorithms that scale efficiently on these architectures. The advent of GPU-based computation will serve to accelerate this behavior, as a single GPU contains hundreds of processor "cores." Explicit algorithms avoid the communication associated with a linear solve, thus parallel scalability of these algorithms is typically high. This work will explore the efficiency and accuracy of three explicit solution methodologies for the Navier–Stokes equations: traditional artificial compressibility schemes, the lattice-Boltzmann method, and the recently proposed kinetically reduced local Navier–Stokes equations [Borok, Ansumali, and Karlin (2007)]. 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.

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