

Abstract Submitted  
for the DFD07 Meeting of  
The American Physical Society

**Exact pressure evolution equation for incompressible fluids** MASSIMO TESSAROTTO, Trieste University, Department of Mathematics and Informatics, MARCO ELLERO, TUM (Technical University of Munich), Germany, NECDET ASLAN, Yeditepe University, Kayisdagi, Istanbul, Turkey, MICHAEL MOND, Ben-Gurion University of the Negev, Beer-Sheeva, Israel, PIERO NICOLINI, Trieste University, Department of Mathematics and Informatics — Several issues concerning the foundations of hydrodynamics still remain unanswered. A significant aspect is the determination of the fluid pressure in isothermal incompressible fluids and the construction of algorithms with permit to time-advance the same fluid pressure. In fact, the incompressible Navier-Stokes equations represent a mixture of hyperbolic and elliptic pde's, which are extremely hard to study both analytically and numerically. However, the interesting question arises whether there exists actually an evolution equation for the fluid pressure which is exactly equivalent to the Poisson equation (i.e., is a Poisson solver). The search of an exact pressure-evolution equation, besides being a still unsolved mathematical problem, is potentially relevant in fluid dynamics. In this note we intend to show that, based on an inverse kinetic theory (IKT) recently proposed for the incompressible Navier-Stokes equations [M. Ellero and M. Tassarotto, *Physica A* 355, 233 (2005)], a solution to this problem can actually be reached. Basic consequences of the result are presented.

Massimo Tassarotto  
Trieste University, Department of Mathematics and Informatics

Date submitted: 31 Jul 2007

Electronic form version 1.4