

ADDENDUM TO
“GAUGE METHOD FOR VISCOUS INCOMPRESSIBLE FLOWS”*

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WEINAN E[†] AND JIAN-GUO LIU[‡]

The following paragraph should appear at the end of Section 1.

Remark 1. Gauge transformation is a well-known concept in physics and has been used as a computational tool also. In fluid dynamics, Buttke was the first to use it as a computational tool to design vortex methods [1], following earlier work of Oseledets and others [3]. An alternative formulation was found by Maddocks and Pego [2] using the impetus-striction variables. This formulation does not seem to have the problem of numerical instability at the linear level. These authors are mainly concerned with writing down the Hamiltonian formulation of Euler’s equation, whereas we are mainly concerned with using the gauge freedom to overcome the difficulties with boundary condition.

REFERENCES

- [1] T. Buttke, *Velocity methods: Lagrangian numerical methods which preserve the Hamiltonian structure of incompressible flows*, in *Vortex Flows and Related Numerical Methods*, edited by J.T. Beale, G.H. Cottet and S. Huberson (Kluwer, Dordrecht), 1993.
- [2] J.H. Maddocks and R.L. Pego, *An unconstrained Hamiltonian formulation for incompressible fluid flow*, *Comm. Math. Phys.*, 170:207–218, 1995.
- [3] V.I. Oseledets, *On a new way of writing the Navier-Stokes equation: the Hamiltonian formalism*, *Russ. Math. Surveys*, 44:210, 1989.

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[†]Department of Mathematics and Program in Applied and Computational Mathematics, Princeton University, Princeton, NJ 08544, (weinan@princeton.edu).

[‡]Institute for Physical Science and Technology and Department of Mathematics, University of Maryland, College Park, MD 20742, (jliu@math.umd.edu).