Dirac brackets for incompressible hydrodynamics and MHD[1]

PHILIP J. MORRISON, University of Texas at Austin, TOMMASO ANDREUSSI, SITAEL S.p.A., FRANCESCO PEGORARO, Dipartimento di Fisica E. Fermi —
It is shown how to impose the incompressibility constraint using Dirac's method in terms of both the canonical Poisson brackets in the Lagrangian variable description and the noncanonical Poisson brackets in the Eulerian description, allowing for the advection of density. Both cases give dynamics of infinite-dimensional geodesic flow on the group of volume preserving diffeomorphisms and explicit expressions for this dynamics in terms of the constraints and original variables is given. Because Lagrangian and Eulerian conservation laws are not identical, comparison of the various methods is made. The presentation will be based on the following:
P. J. Morrison, T. Andreussi, and F. Pegoraro, *Lagrangian and Dirac Constraints for the Ideal Incompressible Fluid and Magnetohydrodynamics*, J. Plasmas Phys. **86**, 835860301 (2020).

Philip Morrison
University of Texas at Austin

Date submitted: 29 Jun 2020 Electronic form version 1.4