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THE FORMULATION OF THE NAVIER-STOKES EQUATIONS ON
RIEMANNIAN MANIFOLDS

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ABSTRACT. We consider the generalization of the Navier-Stokes equation from \mathbb{R}^n to the Riemannian manifolds. There are inequivalent formulations of the Navier-Stokes equation on manifolds due to the different possibilities for the Laplacian operator acting on vector fields on a Riemannian manifold. We present several distinct arguments that indicate that the form of the equations proposed by Ebin and Marsden in 1970 should be adopted as the correct generalization of the Navier-Stokes to the Riemannian manifolds.

CONTENTS

1. Introduction	2
2. The deformation tensor	4
3. Counterexample to an energy estimate	6
4. Restriction arguments	11
5. Non-relativistic limit	13
Acknowledgments	14
References	14

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