

Preface

The subject of these notes is the existence, regularity, uniqueness, and continuous dependence on initial data of classical solutions of certain partial differential equations of physical origin. The equations themselves arise in a variety of different physical contexts and disciplines. The diversity of physical situations modeled stands in contrast with the relative economy of expression: there are many phenomena but few equations. Their main common features are transport by divergence-free vector fields, nonlocality, and nonlinearity. The lectures present a unified mathematical approach for local existence and uniqueness based on solution paths, and global regularity results for nonlocal dissipative active scalar equations.

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