Odd fluids

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Abstract

In many physical fluid systems, the constituent particles present a parity-breaking intrinsic angular momentum: this is the case, for instance, of quantum fluids and superfluids, polyatomic gases, chiral active matter and vortex dynamics. In such situations, only the skew-symmetric component of the total viscous stress tensor, often dubbed *odd viscosity*, is non-zero, implying that the viscosity becomes non-dissipative.

At the level of the mathematical model, the odd viscosity term is responsible for a loss of regularity, as it involves higher order space derivatives of the velocity field and, in the case of non-homogeneous fluids, of the density.

In this talk we consider the dynamics of non-homogeneous incompressible fluids having odd viscosity and we set up a well-posedness theory in Sobolev spaces for the related system of equations. The proof is based on the introduction of a set of suitable "good unknowns" for the system, which allow to put in evidence an underlying hyperbolic structure and to circumvent, in this way, the loss of derivatives created by the odd viscosity term.

The talk is based on a joint work with *Rafael Granero-Belinchón* (Universidad de Cantabria) and *Stefano Scrobogna* (Università degli Studi di Trieste).