Public Abstract

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The longitudinal velocity correlation function of statistically symmetric (homogeneous and isotropic) fluid flows is the correlation of the velocity components parallel to the separation vector as a function of the separation distance.

For incompressible flows this function determines all components of the correlation.

Part I of this thesis shows that it is possible to produce examples of symmetric Gaussian (normal) statistics with negative longitudinal correlations. It is also shown that any smooth, solenoidal field which vanishes outside a bounded domain is surrounded by fields that occur with non-zero probability. And it is also shown that, on some time interval, the longitudinal correlation of these flows remains negative on whole intervals of separation, up to standard (Galerkin) approximations.

The second part of this thesis considers equations for the ocean circulation perturbed by random forcing (white noise). The idea here is the equations represent averages and the true dynamics are modeled by Brownian deviations from the average. Existence and uniqueness for solutions of these equations is proved. Invariant statistics for the case of white noise are considered. Finally, for random kick forcing at fixed time intervals it is shown that invariant statistics exists.