Dynamical Systems approaches in Fluid Mechanics

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Key words: Systems, Invariant Manifolds, Continuation and Bifurcation Methods, Fluid Mechanics, Weak Turbulence, Numerical Tools.

ABSTRACT

The recent development of techniques to compute invariant manifolds, other than just fixed points, is helping to understand the transition between the solutions of a given problem and to weak turbulence. Several classical problems in Fluid Mechanics have benefited from this approach, plane Couette flow, pipe flow, convection in a cube or in rotating spherical shells, etc. (see [1,2] and references therein).

The techniques to compute the invariant manifolds (periodic orbits, invariant tori, homo and heteroclinic connections, unstable manifolds of periodic orbits, etc.) are based on Newton-Krylov methods applied to generalized Poincaré maps, which require accurate time integrations of the system defining the problem and the first variational equations. The study of their stability requires subspace iteration or Arnoldi methods to obtain the leading spectrum [3].

The aim of the minisymposium is to bring together researchers developing the techniques and numerical software for large scale problems (numerical linear algebra, time integrators, etc.) and those applying them to specific problems, in order to share ideas, identify new needs, and to promote collaboration between groups.

REFERENCES

