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Sadruddin Benkadda George M. Zaslavsky (Eds.)

Chaos, Kinetics and Nonlinear Dynamics in Fluids and Plasmas

Proceedings of a Workshop

Held in Carry-Le Rouet, France, 16–21 June 1997



Springer

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Preface

As our understanding of chaotic dynamics becomes deeper, and our encounters with phenomena of chaos become more extensive, we realize that numerous natural processes represent a mixture of regular and erratic parts of the dynamics. We deal with incomplete chaos where the presence of dynamical, or coherent, structures plays a crucial role. There are different indications of the partial coherency of real chaotic processes which are named in different ways in the literature as: coherent structures, intermittency, flights, trappings, ballistic modes, etc. From one point of view, this means a serious complication for routine investigation of chaotic dynamics and its applications. From another viewpoint, this means the loss of universality that is attributed to a “normal” or “pure” chaos. More accurately, we can say that there may be a number of different classes with a specific universality within each. In particular, this is how one arrives at Lévy-type processes or fractional or even multifractional kinetics rather than habitual Gaussian or Poissonian processes. New ideas and new tools are bound to widen our possibilities in the understanding and description of chaotic processes to help us gain new insights in the origin of turbulence.

Most of the material of the book is based on the invited talks at the workshop held in Carry-Le Rouet in the summer of 1997. Some of the articles are written especially for this edition. The book includes a number of related subjects overlapping via common ideas concerned with more specific understanding of the nonuniversality of the chaotic dynamics and utilization of this information in the kinetics of particles, fluids, and plasmas. The workshop was sponsored by the following institutions and organizations: Commissariat à l’Energie Atomique (CEA), CNRS, Commission of the European Union (fusion programme), Conseil Général du Département des Bouches-du-Rhône, Direction de la Recherche et des Etudes Techniques (DRET), Ministère de la Recherche et des Technologies, Université de Provence, and the US Department of Navy. Its Programme Committee included S. Benkadda, M. Shlesinger, and G.M. Zaslavsky.

We would like to express our deep gratitude to all contributors of the volume, who have worked hard to make the issue readable and (we hope) useful.

Marseille, France
New York, NY, USA
May 1998

S. Benkadda
G.M. Zaslavsky

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