

ASTROPHYSICS AND SPACE SCIENCE PROCEEDINGS

S.S. Hasan
R.T. Gangadhara
V. Krishan
Editors

Turbulence, Dynamos, Accretion Disks, Pulsars and Collective Plasma Processes

 Springer

TURBULENCE, DYNAMOS, ACCRETION DISKS, PULSARS AND
COLLECTIVE PLASMA PROCESSES

ASTROPHYSICS AND SPACE SCIENCE PROCEEDINGS

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TURBULENCE, DYNAMOS, ACCRETION DISKS, PULSARS AND COLLECTIVE PLASMA PROCESSES

FIRST KODAI-TRIESTE WORKSHOP
ON PLASMA ASTROPHYSICS HELD
AT THE KODAIKANAL OBSERVATORY
KODAIKANAL, INDIA
AUGUST 27 – SEPTEMBER 7, 2007

Edited by

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Preface

The Kodaikanal Observatory of the Indian Institute of Astrophysics traces its origins to the end of the nineteenth century when it was decided to relocate the Madras Observatory to a high altitude site with a view to initiate observations of the Sun. Many valuable observations were made here including the discovery of outflowing material in sunspots discovered by John Evershed in 1909. The Observatory continues to provide useful solar data as well as serve as a centre for research and training programmes. Moreover, with its serene and beautiful environment, and good infrastructure it is an ideal location for the pursuit of intellectual and pedagogical activity.

In 2006 an initiative was taken to begin a series of schools and workshops in different areas of astronomy and astrophysics with a view to attract students to this field as well as to enhance excellence and greater interaction among researchers working in these areas. The first Kodai-Trieste Workshop on Plasma Astrophysics, which was held at the Kodaikanal Observatory, Kodaikanal during August 27 - September 7, 2007, was a continuation of this effort. Organized jointly by the Indian Institute of Astrophysics, Bangalore and the Abdus Salam International Centre for Theoretical Physics (ASICTP), Trieste, its aim was to provide a strong conceptual foundation in plasma astrophysics. The Workshop was conceived when Prof. K. R. Sreenivasan, Director, ICTP, visited the Indian Institute of Astrophysics in October, 2006.

It is well established that more than 99% of the baryonic matter in the universe is in the plasma state. Most astrophysical systems could be approximated as conducting fluids in a gravitational field. It is the combined effect of these two that gives rise to the rich variety of configurations in the form of filaments, loops, jets and arches. The plasma structures that cannot last for more than a second or less in the laboratory remain intact on astronomical time and spatial scales. High energy radiation sources such as active galactic nuclei involve coherent plasma radiation processes for their exceptionally large output from regions of relatively small physical sizes. The generation of magnetic field, anomalous transport of angular momentum with decisive bearing on star formation processes, the ubiquitous MHD turbulence under

conditions not reproducible in terrestrial laboratories are some of the generic issues still awaiting a concerted effort to be properly understood. Quantum plasmas, pair plasmas and pair-ion plasmas exist under extreme conditions in planetary interiors and exotic stars.

This monograph, consisting of 22 contributions, is organized in six parts dealing with astrophysical turbulence, dynamos, pulsar radiation mechanisms, quantum plasmas, accretion disks, and solar and space plasmas. The workshop brought together several international scientists and young researchers working in plasma astrophysics.

The workshop owes its success to the efforts of a large number of persons, including V. Krishan, the course director, K. E. Rangarajan, the convener, and R. T. Gangadhara, the coordinator. In addition, I am grateful to all the speakers for readily accepting to participate in the workshop and for a timely submission of their manuscripts. I am thankful to the scientific and administrative staff of the Indian Institute of Astrophysics at the Bangalore and Kodaikanal campuses for providing local support.

Bangalore
April 2008

S. S. Hasan

Contents

Part I Astrophysical Turbulence

Aspects of Hydrodynamic Turbulence in Classical and Quantum Systems

J.J. Niemela 3

Observations and Modeling of Turbulence in the Solar Wind

Melvyn L. Goldstein 21

Power Spectra of the Fluctuations in the Solar Wind

V. Krishan 35

Part II Astrophysical Dynamoes

Alpha Effect in Partially Ionized Plasmas

V. Krishan and R. T. Gangadhara 55

Constraints on Dynamo Action

A. Mangalam 69

Planetary Dynamoes

Vinod K. Gaur 85

Part III Pulsar Radiation Mechanism

Pulsars as Fantastic Objects and Probes

Jin Lin Han 99

Pulsar Radio Emission Geometry

R. T. Gangadhara 113

Millisecond Pulsar Emission Altitude from Relativistic Phase Shift: PSR J0437-4715

R. T. Gangadhara and R. M. C. Thomas 137

Magnetosphere Structure and the Annular Gap Model of Pulsars

G.J. Qiao, K.J. Lee, H.G. Wang, and R.X. Xu 147

Wave Modes in the Magnetospheres of Pulsars and Magnetars

C. Wang, D. Lai 169

Polarization of Coherent Curvature Radiation in Pulsars

R. M. C. Thomas and R.T. Gangadhara 177

Part IV Quantum Plasmas

Nonlinear Quantum Plasma Physics

Padma K. Shukla, Bengt Eliasson, Dastgeer Shaikh 191

Dust Plasma Interactions in Space and Laboratory

Padma K. Shukla, Bengt Eliasson, Dastgeer Shaikh 213

Part V Accretion Disks

Magnetorotational Instability In Accretion Disks

V. Krishan and S.M. Mahajan 233

Hybrid Viscosity and Magnetoviscous Instability in Hot, Collisionless Accretion Disks

Prasad Subramanian, Peter A. Becker, Menas Kafatos 249

Transonic Properties of Accretion Disk Around Compact Objects

Banibrata Mukhopadhyay 261

Maximum Brightness Temperature for an Incoherent Synchrotron Radio Source

Ashok K. Singal 273

Nonlinear Jeans Instability in a Uniformly Rotating Gas

Nikhil Chakrabarti, Barnana Pal and Vinod Krishan 281

Part VI Solar and Space Plasmas

An Overview of the Magnetosphere, Substorms and Geomagnetic Storms
G. S. Lakhina, S. Alex, R. Rawat 293

Monte Carlo Simulation of Scattering of Solar Radio Emissions
G. Thejappa, R. J. MacDowall 311

Evolution of Magnetic Helicity in NOAA 10923 Over Three Consecutive Solar Rotations
Sanjiv Kumar Tiwari, Jayant Joshi, Sanjay Gosain and P. Venkatakrishnan 329

Stability of Double Layer in Multi-Ion Plasmas
A.M. Ahadi, S. Sobhanian 337

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