GRAN SASSO SCIENCE INSTITUTE
CENTER FOR ADVANCED STUDIES Istituto Nazionale di Fisica Nucleare

CONSORZIO INTERUNIVERSITARIO PER LA FISICA SPAZIALE

agenzia spaziale italiana

UNIVERSITA' DEGLI STUDI DELL'AQUILA

IL MIO VOLER CERCAR OLTRE LA META

INTERNATIONAL SCHOOL OF SPACE SCIENCE

L'Aquila – ITALY

Complexity and Turbulence in Space Plasmas

18-22 September 2017, L'Aquila (Italy)

Programme and Lecturers

KINETIC PROCESSES

G. Consolini (INAF-IAPS Roma, Italy)
An introduction to kinetic theories

Y. Voitenko (Royal Belgian Institute for Space Aeronomy, Brussels, Belgium)
Kinetic waves and instabilities

G. Zank (University of Alabama in Huntsville, Huntsville (AL), USA)
Kinetic processes and plasma transport

F. Valentini (University of Calabria, Rende, Italy)
Kinetic plasma simulations

A. Vaivads (Swedish Institute of Space Physics, Uppsala, Sweden)
Kinetic domain observations: from Cluster to MMS and beyond

G. Belmont (LPP, CNRS, Palaiseau, France)
Dissipation and irreversibility in space plasmas

MHD AND KINETIC TURBULENCE

V. Carbone (University of Calabria, Rende, Italy)
Space plasma turbulence: from MHD scales to kinetic domain

W. Matthaeus (University of Delaware, Newark (DE), USA)
Magnetic reconnection: on the role of MHD and kinetic turbulence

L. Sorriso-Valvo (CNR-Nanotec, Rende, Italy)
Turbulence observations in heliospheric space plasmas

COMPLEXITY IN SPACE PLASMAS

T. Chang (Kavli Institute for Astrophysics and Space Research, MIT, Cambridge (MA), USA)
Complexity in space plasmas

M. Materassi (CNR-ISC, Sesto Fiorentino, Italy)
Stochastic approaches to space plasmas

M. Echim (Royal Belgian Institute for Space Aeronomy, Brussels, Belgium and Institute of Space Science, Magurele, Romania)
Space plasma complexity: approaches and methods

J. Johnson (Dept. Eng. and Computer Sci., Andrews Univ. Berrien Springs (MI), USA)
Entropy and information theory approaches to space plasma complexity

P. Yoon (University of Maryland College Park USA)
Kappa Distributions: role in plasma kinetic processes, dynamics and complexity

A SPECIAL OPEN SESSION WILL BE DEDICATED TO
ORAL/POSTER CONTRIBUTIONS FROM THE STUDENTS

Board of Directors:

G. Consolini giuseppe.consolini@iaps.inaf.it
INAF-IAPS Roma, Italy

M. Echim marius.echim@oma.be
Royal Belgian Institute for Space Aeronomy, Brussels, Belgium and Institute of Space Science, Magurele, Romania

The Director of the School:

U. Villante umberto.villante@aquila.infn.it

General Information

School activities will be held at Gran Sasso Science Institute in L'Aquila (http://www.gssi.infn.it).
Applications, including a brief curriculum vitae, are due before **June 4th, 2017** through the website **www.cifs-isss.org/application.asp**
The fee of **700 Euro** includes board and lodging at nearby hotels.
Some financial support will be available for a limited number of students.
Students are encouraged to present their own contributions in an open session.
Applications will be evaluated by the Scientific Committee of the International School of Space Science. Successful applicants will be notified by e-mail.

SCHOOL RATIONALE

The universe is primarily populated by the plasma state and the dynamics of space plasmas is extremely complex entailing the interplay of out-of-equilibrium matter and fields. As a consequence of the intrinsic collective nature of plasma interactions the resulting dynamics is often characterized by "complexity" and "turbulence". Turbulence is an ubiquitous process in astrophysical and space plasma contexts. Recently, significant advances have been made in the characterization of the turbulent and complex features of space plasmas in the magneto-hydrodynamic (MHD) domain. However, a full understanding of fundamental processes, such as plasma heating and turbulent particle acceleration, requires a more involved approach, beyond the MHD description, towards the kinetic domain and/or adopting the language of "matter mechanics" instead of "field theory". The use of a simple field theory description, would hide the real complexity of such multi-dimensional and multi-scale systems. Plasma complexity is fundamentally related to the microscopic structure and collective particle dynamics and manifests in the emergence of mesoscopic multi-scale coherent plasma structures. The course is devoted to young researchers and PhD students and will provide an overview of the recent theoretical, numerical and data analysis advances in the description of multi- scale processes in space plasmas. involving dynamical complexity and turbulence. It focus on novel approaches, e.g. kinetic description, stochastic field theory, to the dynamics at the microscopic scales and the coupling with meso- and macroscales.

L'Aquila, Porta Rivera

INTERNATIONAL SCHOOL OF SPACE SCIENCE
c/o Dipartimento di Scienze Fisiche e Chimiche
ssc@aquila.infn.it - www.cifs-isss.org

The International School of Space Science is supported by:
Consorzio "Area di Ricerca in Astrogeofisica", Fondazione CARISPAQ, Comune dell'Aquila,
Istituto Nazionale di Astrofisica, International Union of Geodesy and Geophysics, European Space Agency