TURBOPLASMAS is a European Seventh Framework Programme - Marie Curie International Research Staff Exchange Scheme (IRSES) project, which has the objective to carry out research in the field of space plasmas, with particular emphasis on solar wind turbulence and, more in general, on plasma turbulence, and on related phenomena such as magnetic reconnection. The exchange programme involves a consortium of six research institutions – the University of Calabria, Italy (CALABRIA), the Imperial College of London, United Kingdom (IMPERIAL), the University of Warwick, United Kingdom (WARWICK), the University of California at Berkeley, United States of America (BERKELEY), the University of Delaware, United States of America (DELAWARE) and the University of Buenos Aires, Argentina (BUENOS AIRES). All these institution have a long research experience in various fields of space plasma physics. Four of these six partners have EU financial support for the exchange of staff, according to the Marie Curie IRSES regulations. The programme did last 48 months, and the original exchange scheme included 212 full-time equivalent months of secondment, with a contribution of about 290000€ from the European Commission.
The complex dynamics of turbulent plasmas is a challenging subject for the scientific community. The solar system is the most accessible environment for its study. Space plasmas are in a strongly turbulent regime, rich in instabilities and interesting non-linear phenomena (excitation of waves, structures formation, wave-particle interaction, reconnection), and in a wide range of conditions (e.g. production. magnetization or energy input). Due to the large availability of experimental measurements provided by instruments on-board space missions, the study of solar system plasmas is of great interest for the understanding of fundamental plasma processes. The development of high resolution numerical simulations plays a key role to understand the phenomena and interpret the observations. The aim of this project is to provide concrete advances in the understanding of a very complex phenomenon, namely the turbulent behaviour of collisionless plasmas. In particular, we address a number of scientific objectives such as:
1) to describe the large scale and inertial range turbulence in heliospheric plasmas;
2) to advance the understanding of dispersive and dissipative phenomena in plasma turbulence;
3) to study coherent structures and reconnection in turbulent plasmas;
4) to develop and apply new multi-spacecraft analysis techniques, and to support new space missions;
5) to perform and study high resolution numerical simulations of Magnetohydrodynamics, Hall-Magnetohydrodynamics and kinetic plasmas.
During the project, the exchange scheme has been carried on so that the research teams have considerably advanced the state of the art of the scientific objectives indicated above. An excellent global production of scientific articles (106, including 11 review articles and two Special Issues, plus several other articles currently under evaluation or in press) on high impact factor and broad audience journals (such as Physical Review Letters, The Astrophysical Journal and Space Science Reviews), has been the primary result of this project. Along with this, the team's Researchers have disseminated their

new results at the most important meetings and conferences in the field (as for example the American Geophysical Union (AGU) and the European Geosciences Union (EGU) meetings), where several session have been organized or co-organized by project's partners. The team is also now deeply involved in the proposal and assessment of the ESA space mission THOR, which has been conceived in order to make the necessary step forward in the solar wind turbulence measurements.

Among the most innovative results, highlights include: the clarification of the nature of dissipation in solar wind turbulence, also through comparison with numerical simulations; the role of magnetic reconnection in the dissipative and heating processes in the solar wind; the first description of small-scale properties of solar wind density fluctuations; the inclusion of alpha particles in kinetic numerical simulations of turbulence in plasmas; the definition of spatial and temporal relevant scales in solar wind turbulence; the launch of and first data collection from the TRIO-CINEMA mission; the definition of the Science Operation modes of the Solar Orbiter space mission; the approval of an instrument suite for mesospheric measurement, TILDAE, to be launched December 2015 on-board the NASA space mission GRIPS; the assessment of the ESA space mission proposal THOR for measurements of small-scale turbulence in the solar wind, that has reached the final selection stage.

These results represent substantial steps toward the understanding of the main physical processes occurring in the solar wind and, more in general, in turbulent plasmas. Besides the direct impact on the understanding of the Sun-Earth connection (including Space Weather), the results of this project will be relevant for technological purposes. Indeed, phenomena occurring in plasma turbulence are among the main problems for the confinement of plasma (e.g. in fusion devices), and are thus of great strategic interest for energetic and industrial purposes. Finally, the results obtained will represent a crucial support to the next generation scientific space missions, and have opened and strengthened a trans-national network of collaborations between scientists of institutions that operate in the field.

List of Keywords: Solar wind, turbulence, space physics, plasma physics, magnetohydrodynamics, space exploration