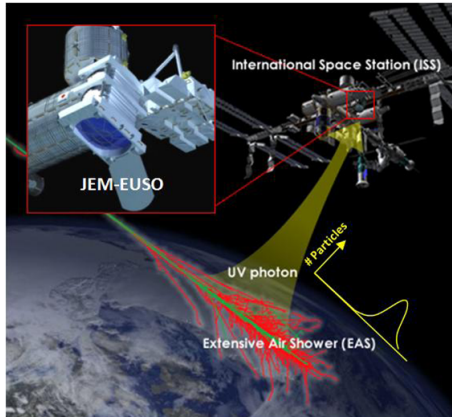


Planetology; Signal-Image Processing / Numerical Methods

METEOR: Modelling of space-based and ground-based observations of meteors and exotic matter



The use of space-based platforms for the observation and recording of transient luminous events in the terrestrial atmosphere has important applications to fundamental physics (ultra-energetic cosmic rays events, transit of exotic matter) and planetary science (meteors and fireball events). Objective of METEOR is a full immersion in the topic of transient luminous events of extraterrestrial origin, including the acquisition of the necessary background, a systematic search of the scientific literature and of the documents already produced by the JEM-Euso collaboration, and the use and possible improvement of dedicated numerical algorithms to simulate a large variety of possible events, through a systematic investigation of the space of free physical parameters. Different kinds of phenomena will be investigated, ranging from meteor events to the detection of the transit

of exotic matter in the atmosphere, a so far largely unexplored field. Approximately one week will be devoted to lectures covering the theoretical background of the covered topics. A significant fraction of the time will be devoted to numerical simulations. Whenever possible, some time will be devoted to laboratory experiment activities, taking profit of the TurLab facility of the Torino University, in order to strengthen the synergy between numerical simulations and experimental evidence. The same methodology will be applied to the analysis of FRIPON data. FRIPON is a network of ground-based full-sky cameras to observe meteors and fireballs. A FRIPON camera is currently in operation at the Astrophysical Observatory of Torino.

Theory

by A. CELLINO

The origin of meteors is twofold: they may be caused by powders released by comets during passage at the perihelion, subsequently scattered along the orbit under the effect of solar radiation pressure. This may cause periodic meteor showers visible in specific epochs of the year. Sporadic meteors are instead more often due to so-called meteoroids, dynamically evolved asteroidal bodies removed from the main asteroid belt between Mars and Jupiter. These bodies produce the brightest sporadic meteors, since they can be much greater and more compact than typical cometary powder, and can produce extremely bright events when crossing the atmosphere. Meteoroids

are little known population, because they are generally too small to be visible by remote observation using telescopes. Having short dynamical lifetimes, meteoroids must be continuously replenished from the asteroid main belt by means of gravitational and not gravitational mechanisms. Census and mass distribution of meteoroids are important to improve our knowledge of the inventory and evolution of minor bodies in the solar system.

Applications

by M. BERTAINA

The trainee will use and possibly improve available numerical codes to simulate the observation of meteor/exotic matter events by JEM-EUSO, its pathfinder Mini-EUSO as

well as a FRIPON camera, with an adequate coverage of the space of free parameters to achieve an exhaustive analysis of the expected output of a space-based and ground-based experiment. Part of the program will include also the possibility to analyse FRIPON data at the Astrophysical Observatory of Torino as well as conduct experiments at the TurLab facility of the University of Torino.

See also

[Details 1](#)
[Details 2](#)

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