

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
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SCIENCE AND APPLICATIONS ON ISS WITHIN ESA'S ELIPS PROGRAMME

Abstract

The International Space Station (ISS) offers unique possibilities for research and applications in a broad range of areas: from fundamental physics to cell biology and human physiology, from technology demonstration of future space systems to acquiring skills and knowledge necessary for future human exploration in space. Since Europe's main contribution to ISS, the versatile Columbus laboratory was attached to ISS in Feb 2008, ESA is performing about 40 experiments on ISS per year, within the context of ELIPS (European Programme for Life and Physical Sciences in Space). Some highlights have been showing the multi-stability of convection patterns in the spherical fluid shell, that the visual perception of ambiguous figures is modified in μg , that some organisms can survive the harsh environment of open space for months and how a space based tracking system can provide global shipping traffic control. The most rewarding part of ISS utilization is however ahead of us. Many important experiments are soon to be deployed, like the unique ACES (Atomic Clock Ensemble in Space) that will provide universal unprecedented time accuracy and make tests of Einstein's theory of general relativity. EML (ElectroMagnetic Levitator) will be launched in 2013 and become a unique facility for material science providing crucial data for improved material production in industry, similar to the recent hugely successful IMPRESS project. In human research - necessary for human exploration as well as in various ways improving health on Earth - it is the accumulation of data from many subjects (i.e. astronauts) that provides results, and this takes several years. A variety of plant, cell and developmental biology experiments are being performed in several advanced ESA facilities. However, both this field and human research would benefit tremendously by a rodent research capabilities on ISS, that could be jointly provided by several ISS partners together. The Space Station also offers excellent opportunities for climate change related research. ESA's SOLAR payload has for several years measured the sun's irradiance and planned experiments are ASIM (Atmosphere-Space Interaction Monitor) and ICARUS (bird-tracking from ISS). Under study is a possible large dedicated experiment directly aimed and some of the ECV:s (Essential Climate Variables). With the acquired experience the optimum use of the full ISS potential for science and applications in space is continuously progressing year by year. At the same time the research activities in space must be closely connected to ground-based research, which is encouraged and supported by ELIPS.