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Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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FLUMIAS AND PERWAVES: TWO "WORLD FIRST" EXPERIMENTS IN SPACE

Abstract

FLUMIAS (**Flu**orescence-**Mi**croscopic **A**nalysis Unit for **S**pace Applications) and PERWAVES (**Per**colating **R**eactive **Waves** in Particulate Suspensions) are two recently developed exciting new experiments.

The FLUMIAS experiment facility belongs to the field of biological sciences and is equipped with a confocal spinning disk fluorescence microscope. It enables reseachers for the first time to investigate living cells with high temporal and spatial resolution under real microgravity conditions. FLUMIAS, funded by the German Space Agency DLR and built by Airbus Defence and Space in cooperation with FEI Germany, has been successfully flown on TEXUS 52 in spring 2015 and is scheduled for a re-flight with some modifications improving the science return on TEXUS 54 in spring 2018. Besides TEXUS the FLUMIAS experiment has also been successfully flown on the 24th (spring 2014) and 29th (autumn 2016) DLR parabolic flight campaigns and is scheduled for the upcoming 32nd DLR parabolic flight campaign in June this year. Both, human cells and plant cells have already been used as sample material. Due to the successful implementation of FLUMIAS on TEXUS an ISS version of FLUMIAS is currently under development. With FLUMIAS DEA ("Deutscher ESA-Astronaut") a technology demonstrator will be installed on the ISS within the framework of the "Horizons" mission of Alexander Gerst already this year.

The PERWAVES experiment funded by the European Space Agency ESA and built by Airbus Defence and Space has been successfully flown on MAXUS 9 in spring 2017. For the first time the PERWAVES experiment enabled the reseachers to investigate particulate flame fronts in a space environment. Scope of the PERWAVES experiment is the analysis of the discrete particle combustion without disturbing gravitational effects. Small iron particles with sizes around 25 μm are used as combustible material. Serveral optical diagnostic tools have been implemented in the experiment facility to capture as much information as possible about the percolating reactive waves. Due to the complex nature of the discrete particle combustion several drop tower campaigns for parameter optimization had been conducted during the development process.