MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences Onboard the International Space Station and Beyond - Part 2 (7)

Author: Mr. Daniel Calvo
E-USOC, Universidad Politécnica de Madrid, Spain, dcalvo@eusoc.upm.es

Prof. Ana Laveron-Simavilla
Universidad Politécnica de Madrid, Spain, alaveron@eusoc.upm.es
Mr. Jacobo Rodriguez
Universidad Politécnica de Madrid, Spain, jrodriguez@eusoc.upm.es
Mr. José Miguel Ezquerro Navarro
E-USOC, Universidad Politécnica de Madrid, Spain, jezquerro@eusoc.upm.es
Mr. Jose Javier Fernandez Fraile
E-USOC, Universidad Politécnica de Madrid, Spain, jfernandez@eusoc.upm.es

E-USOC AND THE GEOFLOW-2B EXPERIMENT OPERATIONS

Abstract

E-USOC, Spanish User Support and Operations Centre, is one of the nine similar centres distributed all across Europe. These centres perform the operations of experiments on board Columbus Module, the main contribution from the European Space Agency (ESA) to the International Space Station (ISS).

This experiment studies the movement and behaviour of a fluid contained in between two concentric spheres, representing the geophysical fluid inside the Earth. This fluid motion is observed by means of Wollaston Shearing Interferometry images, along with the measurements of the microgravity disturbances during science runs, aims to capture some essential features of the Earth mantle convection.

GeoFlow-2B is the follow up of GeoFlow-2 with a new set of scientific parameters keeping hardware identical: Maximum frame rate runs, aiming to study the evolution of the patterns at maximum temporal resolution; long no rotation runs, to check whether the convective pattern has reached the steady-state; no rotation runs with different High Voltage, to study the nonlinearity observed at lower central Rayleigh numbers and rotation runs with higher gradient of temperatures.

The GeoFlow-2 EC was launched on ATV-2 Johannes Kepler and was installed inside the Fluid Science Laboratory (FSL), located in the Columbus laboratory, by US astronaut Kevin Ford on December 3rd, 2012 for GeoFlow-2B. Once inside the facility, E-USOC operators use telescience to operate the experiment from their control room: Sending telecommands to control GeoFlow-2B subsystems, and receiving telemetry, scientific images and microgravity measurements from the experiment.

Starting in December 2012 and with an end date still to be confirmed, GeoFlow-2B comprises 48 scientific runs and an estimated of 1600 hours of science, from which 12 mandatory runs are already completed.

GeoFlow-2B experiment benefits from GeoFlow-2 lessons learned as well as faces its own new challenges. Among those, the most important one was the manpower limitation which led to a very demanding planning constraint and a change in the operational concept, returning to MMA as a microgravity measurement system due to its lower downlink time requirement. Also, an optical checkout was carried with near realtime assessment in order to improve the degraded images quality observed at the beginning of operations.

This paper will present a brief description of the GeoFlow-2B project, address the execution of such a complex mission and provide an overview of the activities and responsibilities of E-USOC. Furthermore, it will present the outcomes of the mission, as well as lessons learned and conclusions.