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GEOFLOW-2: RESULTS AND EXPERIENCES FROM A LONG TERM MISSION ON THE ISS

Abstract

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

The GeoFlow-2 experiment is a follow up of the first GeoFlow experiment, which suffered a malfunction in January 2009 that forced its interruption and return to ground. The GeoFlow-2 Experiment Container (EC) configuration and performances are identical those of the GeoFlow EC, but a more pronounced temperature dependent viscosity fluid was selected upon results obtained from 2008 on orbit execution.

The purpose of this experiment is to capture some essential features of the Earth mantle convection; it 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. Parallel acceleration data is acquired to allow tracking possible microgravity disturbances.

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 ESA astronaut Paolo Nespoli on March 19th, 2011. Once placed in the facility, E-USOC operators use telescience to operate the experiment from their control room: telecommands are sent to control the different GeoFlow-2 subsystems, and telemetry, scientific images and microgravity measurements from the experiment are received.

Starting in March 2011 and with a foreseen end in March 2012, GeoFlow-2 experiment is being a very long and demanding mission, where an important coordination with all the entities involved is being performed. Aspects as different as planning tasks, engineering support, data quality assessment and systems operation and monitoring (GeoFlow-2, FSL and Columbus), between several others key points, have been managed using different strategies.

Currently, a total of 62 scientific runs have been successfully performed, accumulating 1160 hours of science, which represent almost the complete scientific programme, including mandatory and optional runs.

This paper will present a brief description of the GeoFlow-2 project, address the preparation and 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.