

## **Citation for the 2019 RAS Group Achievement Award (G): The Cluster Science and Operations teams**

**The 2019 Geophysics Group Award is awarded to the Cluster Science and Operations teams, for their continued success ensuring the operations and scientific exploitation of the European Space Agency's Cluster mission.**

Cluster continues to be the world's leading multi-spacecraft mission to study the structure and dynamics of Earth's magnetic and plasma environments. Launched in 2000, following an earlier failed launch in 1997, Cluster continues to provide new, ground-breaking observations.

UK groups from Imperial College, Mullard Space Science Laboratory, and the University of Sheffield lead the magnetometer and low-energy plasma instrument teams, as well playing a leading role in the wave consortium. Furthermore the Cluster Joint Science Operations Centre (JSOC), located at the Science and Technology Facilities Council's RAL Space, continues to provide mission support and science operations planning, one of only a few examples where the responsibility for this critical activity has been contracted to a group outside ESA. Flight control by the Operations Team is conducted from ESA's European Space Operations Centre (ESOC), Darmstadt, Germany, where numerous innovative techniques have been developed to ensure this long-running mission keeps flying.

The Cluster teams have pioneered the development of some of the key techniques now being used in multi-spacecraft data analysis, such as the QSAS analysis software, produced at Queen Mary College, and the use of curlometry for the derivation of field-aligned currents.

Cluster has produced a very wide range of science highlights, from new insights into the microscale physics of boundary regions, through mesoscale coupling between the magnetosphere and ionosphere, to global-scale studies of the response of the magnetosphere to the solar wind.

It is for these reasons that the 2019 Geophysics Group Award is given to the Cluster Science and Operations teams.