J-MAG : THE MAGNETOMETER INSTRUMENT ON JUICE. M. K. Dougherty[1] and the J-MAG Team, [1]Space and Atmospheric Physics, The Blackett Laboratory, Imperial College, London, SW7 2AZ, UK, m.dougherty@imperial.ac.uk.

Introduction: The magnetometer instrument is one of the core instruments on the ESA/JUICE spacecraft and is critical in order to resolve prime science objectives of the JUICE mission. The instrument is a dual fluxgate plus scalar sensor package on a spaceraft provided boom.

The instrument: The combination of two fluxgate instruments plus a scalar sensor is driven by the science performance requirements necessary to meet the JUICE science objectives on a non-spinning spacecraft, as well as enabling calibration of the instrument suite once inside the Jovian system. The two heritage fluxgate sensors are being built by Imperial College London, UK and the Technical University of Braunschweig, Germany and the scalar sensor is a coupled dark state magnetometer from the Space Research Institute in Graz, Austria.

Overarching science themes: The importance of a magnetometer instrument on JUICE can be described under two separate themes:

1. The magnetic field drives the plasma processes occurring within the Jupiter system. Understanding such observations allows for a better understanding of dynamical plasma processes, of the generation of aurora and of the various current systems which arise within this rapidly rotating magnetosphere; the interactions of the magnetosphere of Ganymede within the Jovian magnetosphere within which it is embedded; to name but a few.
2. However the cutting edge magnetometer science which is unique to JUICE lies in being able to gain an understanding of the interior structure of the icy moons of Jupiter, specifically those of Ganymede, Callisto and Europa. Of particular interest are knowledge of the depth at which the liquid oceans reside beneath their icy surfaces, the strength of any internal magnetic fields such as at Ganymede and the strength of any induced magnetic fields arising within these oceans.

Science objectives: The primary science objectives of JUICE which will be constrained by the magnetic field observations and which drive the performance requirements of the J-MAG instrument include:

- At Ganymede:
  - Characterization of the extent of the ocean and its relation to the deeper interior
  - Characterization of the ice shell
  - Characterization of the local environment and its interactions with the Jovian magnetosphere
  - Description of the deep interior and magnetic field generation
- At Europa, further constrain the depth of the liquid ocean and its conductivity
- At Callisto, characterize the outer shells, including the ocean
- Compare differentiated (Ganymede and Europa) and undifferentiated bodies (Callisto)
- Explore the Jovian magnetosphere
  - Characterize the magnetosphere as a fast rotator
  - Characterize the magnetosphere as a giant accelerator
  - Understand the moons as sources and sinks of magnetospheric plasma.