

Jupiter Magnetosphere and Moons Plasma (JuMMP) Investigation for EJSM

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Summary of JuMMP science objectives - 1

Jupiter magnetosphere

- Identify the sources and sinks of plasma using energy spectra, charge state and elemental composition.
- Characterise the physics of acceleration, transport and escape of plasma from the magnetosphere.
- Characterise Jupiter's magnetodisc
- Determine the global configuration and dynamics plasma populations in the jovian magnetosphere.
- Identify the role of processes such as reconnection

Summary of JuMMP science objectives - 1

Moon interactions

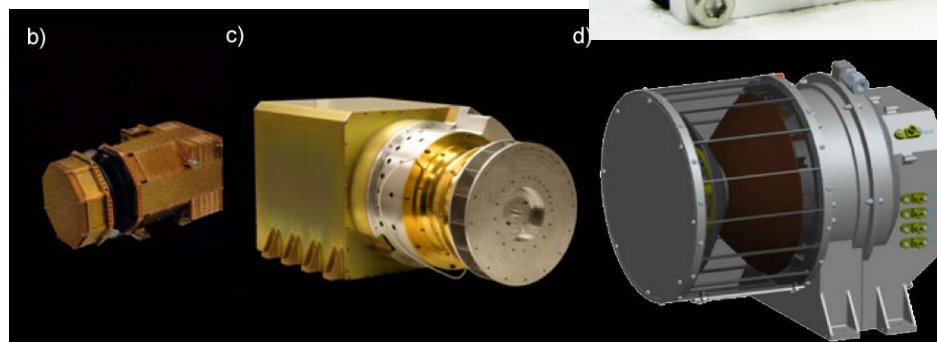
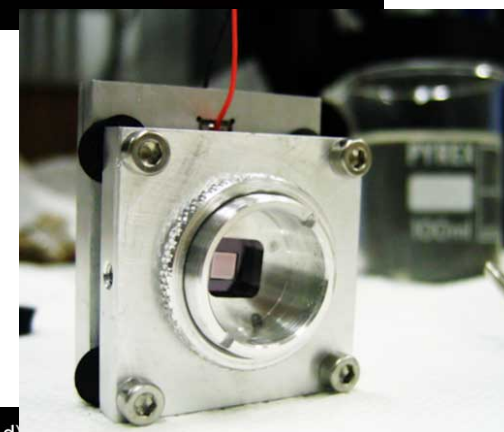
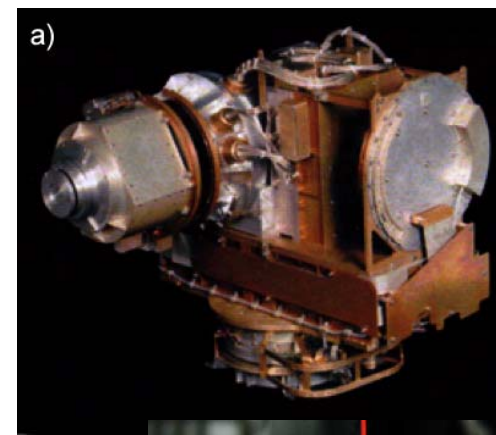
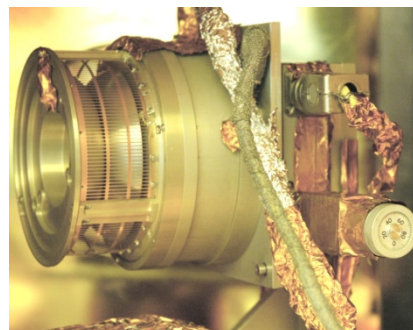
- Determine the magnetosphere-satellite interactions using measurements of ions, electrons and neutrals.
- Investigate the absorption of energetic ions by Ganymede
- Identify the ions in, and escaping from, Ganymede's ionosphere
- Study the modification of Ganymede's surface and atmosphere through ion bombardment.
- Study similar processes at Callisto (JGO flybys) and Europa (JuMMP-JEO)

JuMMP Baseline Instruments – JGO & JEO

- JENI
 - Jupiter Electron and Negative Ion Sensor
- JIMS
 - Jupiter Ion Mass Spectrometer
- LENA
 - Laplace-Energetic Neutral Atoms
- AMMICE
 - Advanced Mass and Ionic Charge Composition Experiment

Heritage

- Outer Planets
 - CAPS on Cassini, PEPE on DS1
 - LENA on Bepi Colombo, Image, Twins
 - SWAP on New Horizons
- Radiation mitigation
 - JADE-I on JUNO
 - Double Star PEACE
- Planetary protection
 - ExoMars Pancam
- Composition
 - CAPS
 - PEPE
 - HPCA on MMS



Technology development activities - 1

- JENI implementation – STFC funded
 - Instrument design and optimisation study
 - Micro-fabricated instrument development
- JIMS and AMMICE – US funded
 - Instrument design and optimisation study
 - AMMICE implementation
- LENA implementation – Italian Space Agency



Technology development activities - 2

- Instrument development studies
 - Design optimisation, accommodation, resource
- Radiation mitigation
 - Radiation shielding
 - Requirements
 - Impact on mass and power
 - Impact on Instrument performance and data returned
- Spacecraft and environment effects impact
- Common Electronics development
 - Radiation shielding
 - Instrument resources optimisation

Miniaturised Plasma Analyser

EJSM challenges

- Radiation hardness
- Background environment
- Instrument resources
- Instrument accommodation
 - Common electronics
 - Field-of-view
- JEO is particular challenge

Miniaturised Plasma Analyser

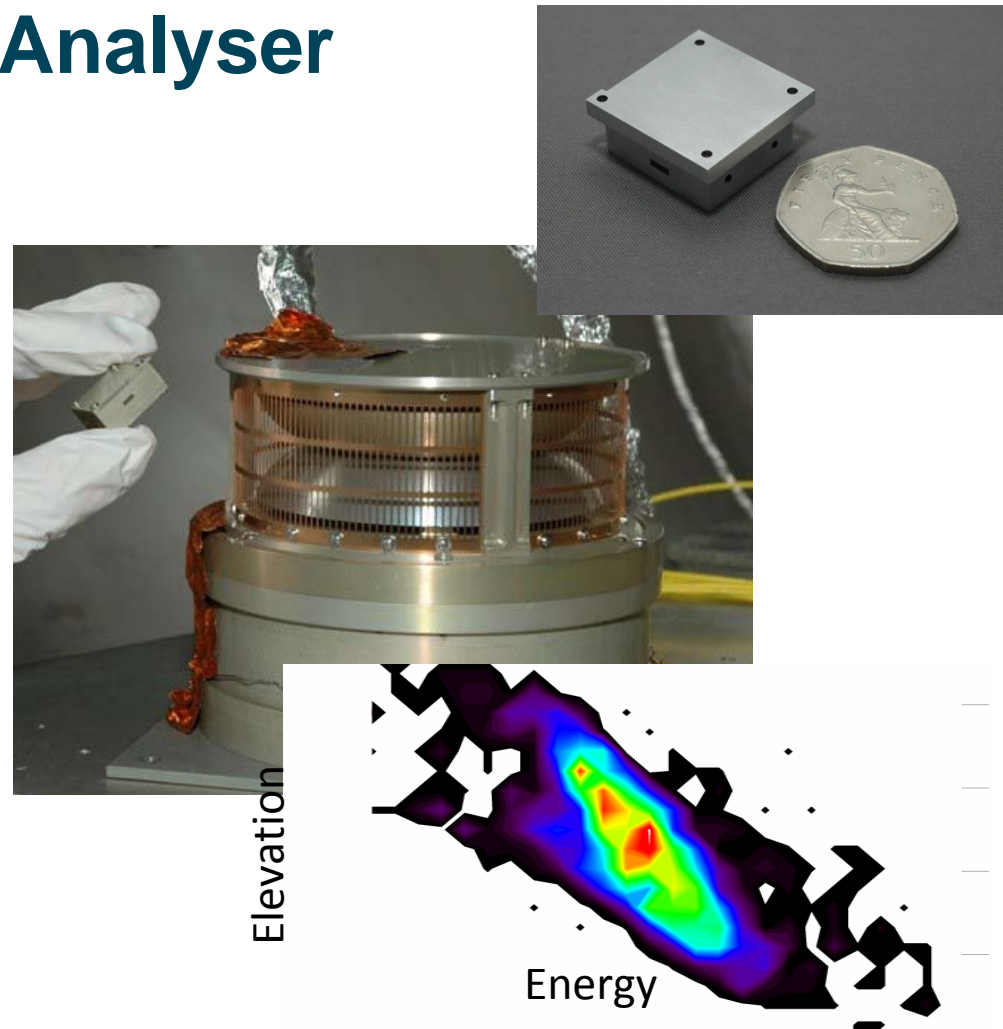
Advantages

- More analysers – fov, speed, sensitivity
- Flexibility with instrument accommodation
- Radiation and background mitigation
 - Small detector x-section
 - Anti-coincidence techniques for background mitigation
 - Reduced shielding mass
- Low resource – mass, power, cost

Miniaturised Plasma Analyser

Proof-of-concept analyser

- Currently under Test
- Instrument Analyser Concept – TRL 4
- Full prototype – mid 2010
- Estimated resources:
 - < 300 gms, 5 cm dia
 - Low shielding mass
- Miniaturised rad hard electronics next focus



Summary

- Strong team with strong heritage
- Interest in both JGO and JEO
- Team meeting last week
- Studies underway
 - Science requirements
 - Instrument TDAs
 - Radiation mitigation studies
 - Systems Engineering