JUICE/PEP instrument and its science (and more)

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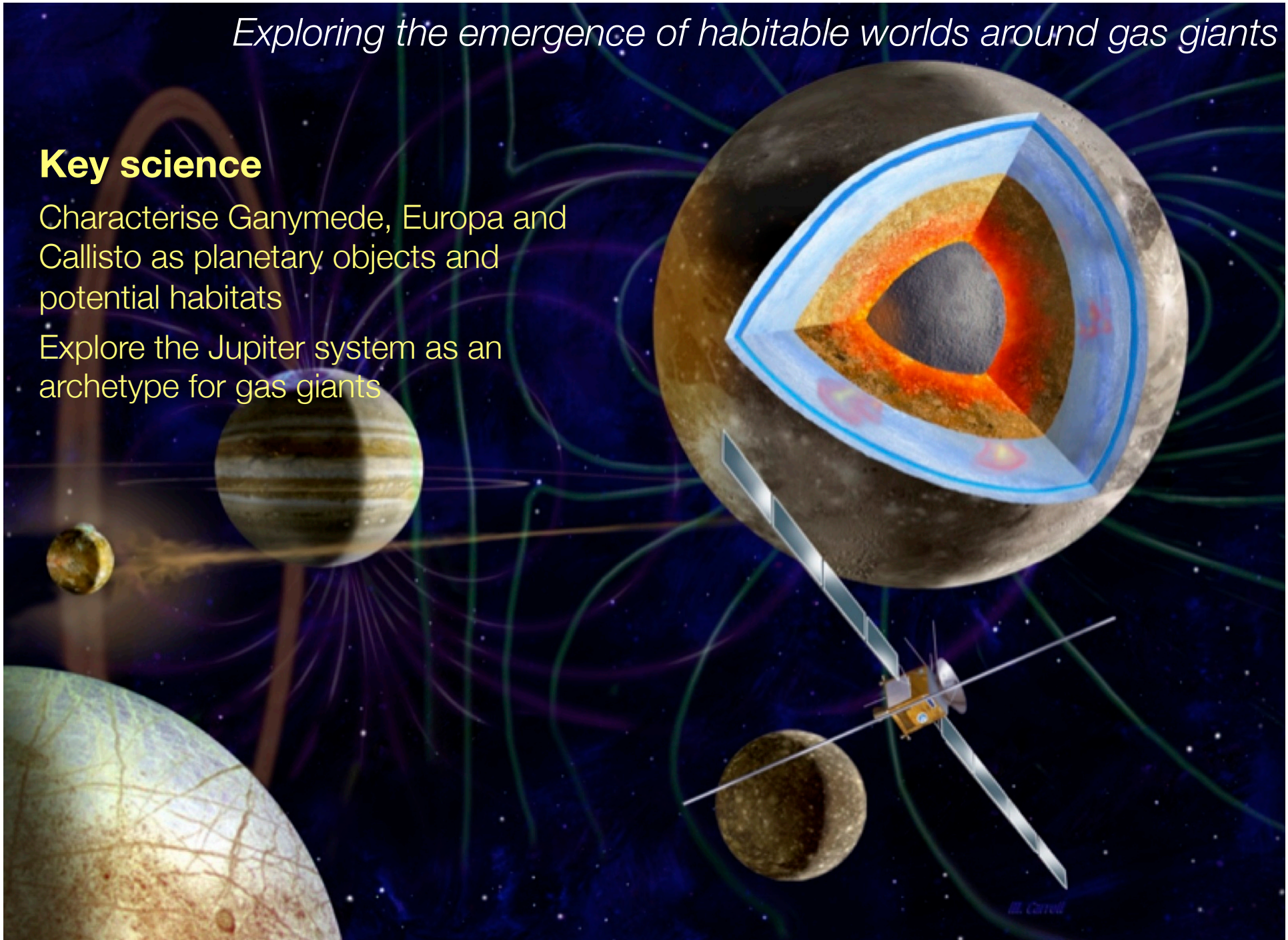
Messages

- ESA's JUICE mission explores Jupiter system
  - Launch 2022. Arrival 2030. How old will you be?
- JUICE adresses icy moons and Jovian magnetosphere
- Plasma Environment Package measures particles of various energies in all charge states.
- Magnetometer and plasma wave instruments go together

西暦	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
和暦	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	1	2	3	4	5
2030年	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37

JUICE, JUpiter ICy moons Explorer

Exploring the emergence of habitable worlds around gas giants



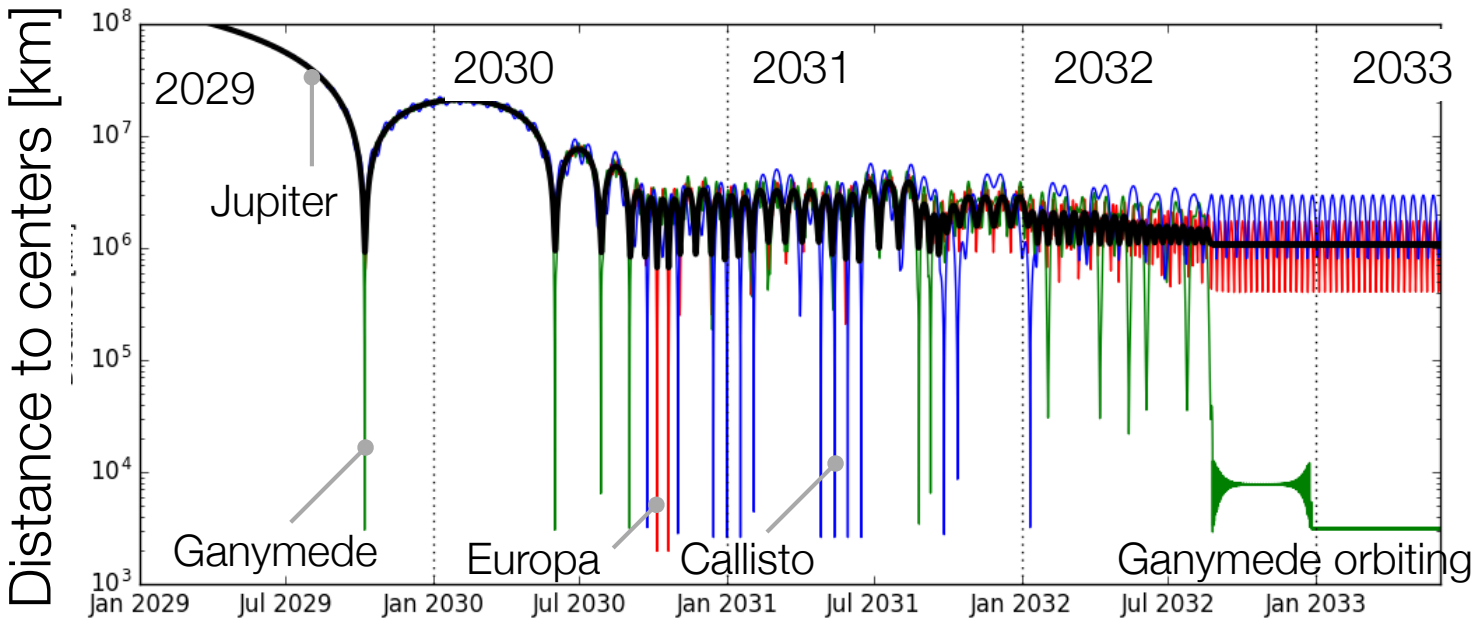
Key science

Characterise Ganymede, Europa and Callisto as planetary objects and potential habitats

Explore the Jupiter system as an archetype for gas giants

JUICE timeline

- Launch in 2022, arrival 2030. Cruise in 7.6 years
- End of mission Jun 2033 planned. 11 years operations.

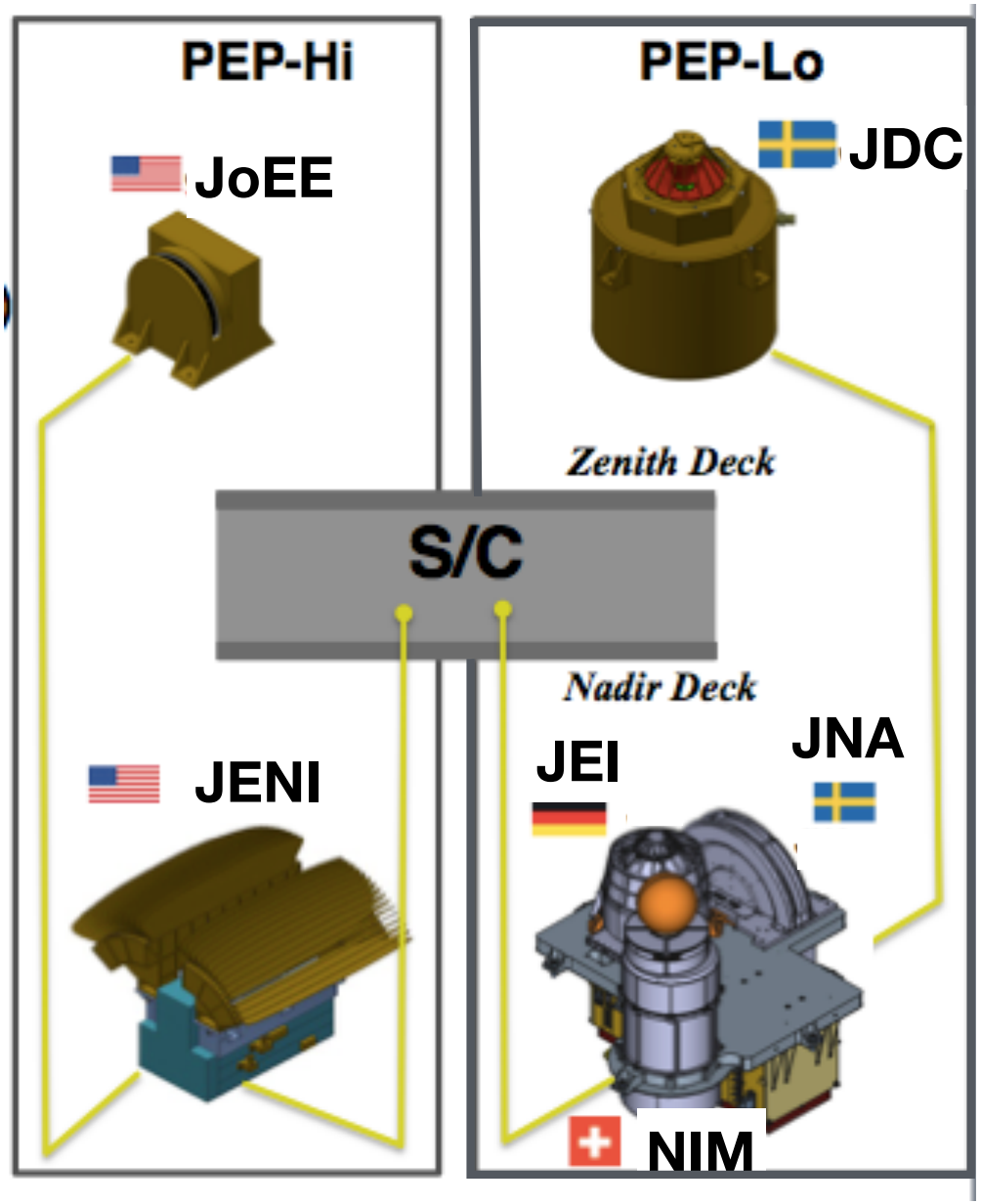


JUICE instruments

P.L.	INSTRUMENT	PRINCIPAL INVESTIGATOR
JANUS	Camera	P. Palumbo, Università degli Studi di Napoli "Parthenope"
MAJIS	Visible-IR spectrometer	Y. Langevin, Institut d'Astrophysique Spatiale
UVS	UV spectrometer	R. Gladstone, Southwest Research Institute
SWI	Sub-mm wave instrument	P. Hartogh, Max-Planck-Institut für Sonnen–systemforschung
GALA	Laser altimeter	H. Hussmann, DLR Institute of Planetary Research
RIME	Ice penetrating radar	L. Bruzzone, Università degli Studi di Trento
J-MAG	Magnetometer	M. Dougherty, Imperial College London
PEP	Plasma package	S. Barabash, Swedish Institute of Space Physics, Kiruna
RPWI	Radio and plasma wave investigation	J.-E. Wahlund, Swedish Institute of Space Physics, Uppsala
3GM	Radio science experiment	L. Iess, Sapienza Università di Roma
PRIDE	VLBI radio science	L. Gurvits, Joint Institute for VLBI in Europe

In situ

PEP configuration

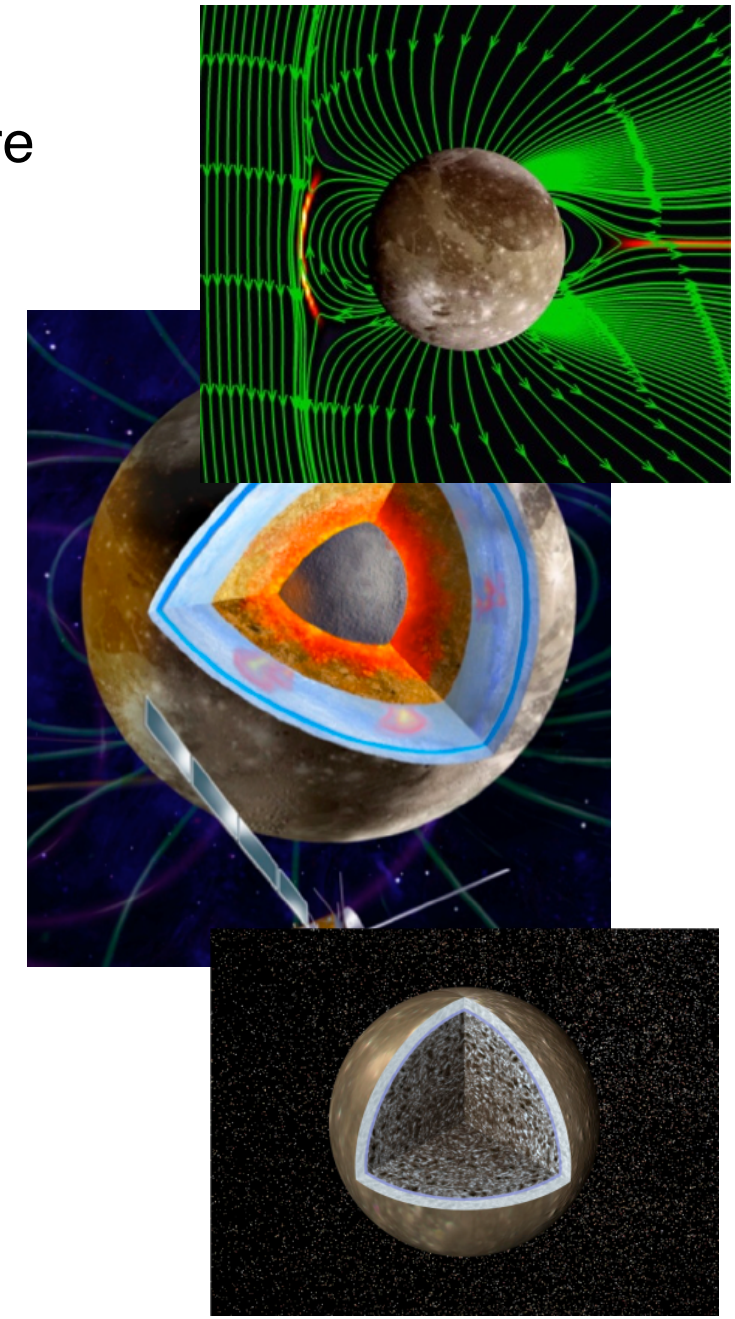


Courtesy of Barabash

- PI: Stas Barabash Swedish Institute of Space Physics, Kiruna
- Co-PI: Peter Wurz University of Bern
- 20 PI/Co-I institutes from 12 countries (including JAXA/ISAS)

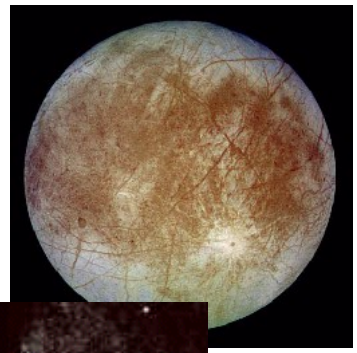
Main science objectives

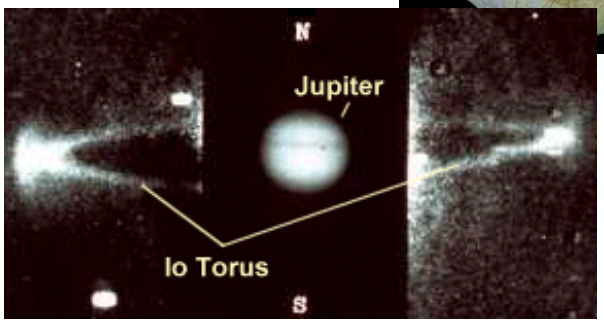
- Magnetospheric Ganymede
  - Complex Ganymede–magnetosphere interaction
  - Ganymede's exosphere and surface composition
  - Ganymede's interior
- Inert Callisto
  - Callisto–magnetosphere interaction
  - Callisto exosphere



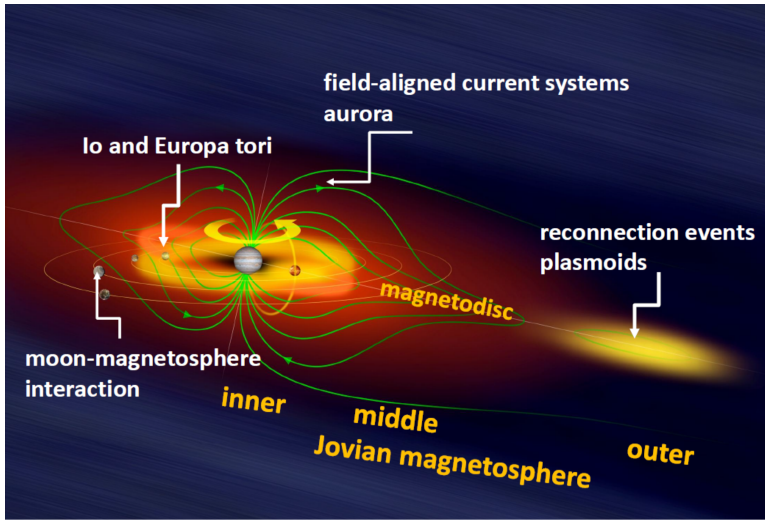
Main science questions

- Moons as plasma source
  - Release materials from the Europa surface and alternation of its exosphere and surface
  - Io and Europa neutral and plasma tori
- Rotating Jovian magnetosphere
  - Plasma transport, heating, and acceleration
  - Understanding the magnetodisk





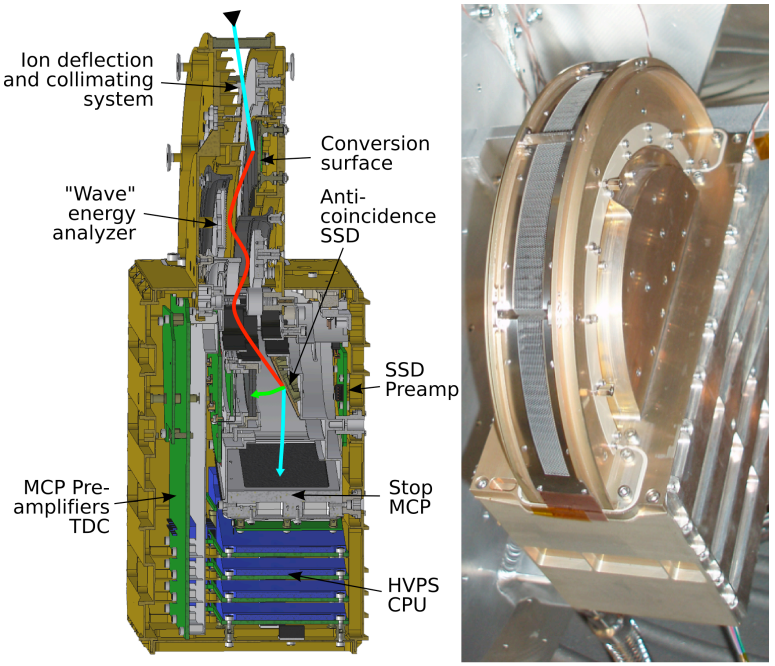
N.M. Schneider, J.T. Trauger
Catalina Obs.



Credit: Max-Planck Institute for Solar System Research

JNA: Deep Japanese Contribution

- JNA, a highly innovative sensor measuring energetic neutral atoms (ENAs)
  - Nearly identical to flight-tested and successfully operated instruments (Chandrayaan-1, a flight unit for BepiColombo delivered)
  - Key performance parameters
    - Energy range: 10–3200 eV
    - Angular resolution: 7° x 10°

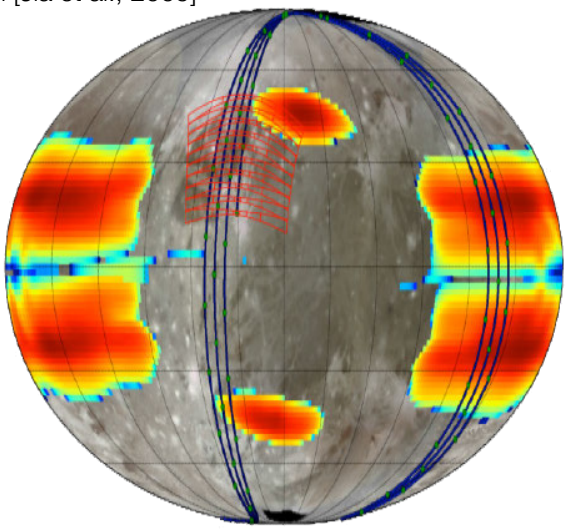


Courtesy of Barabash

JNA sciences

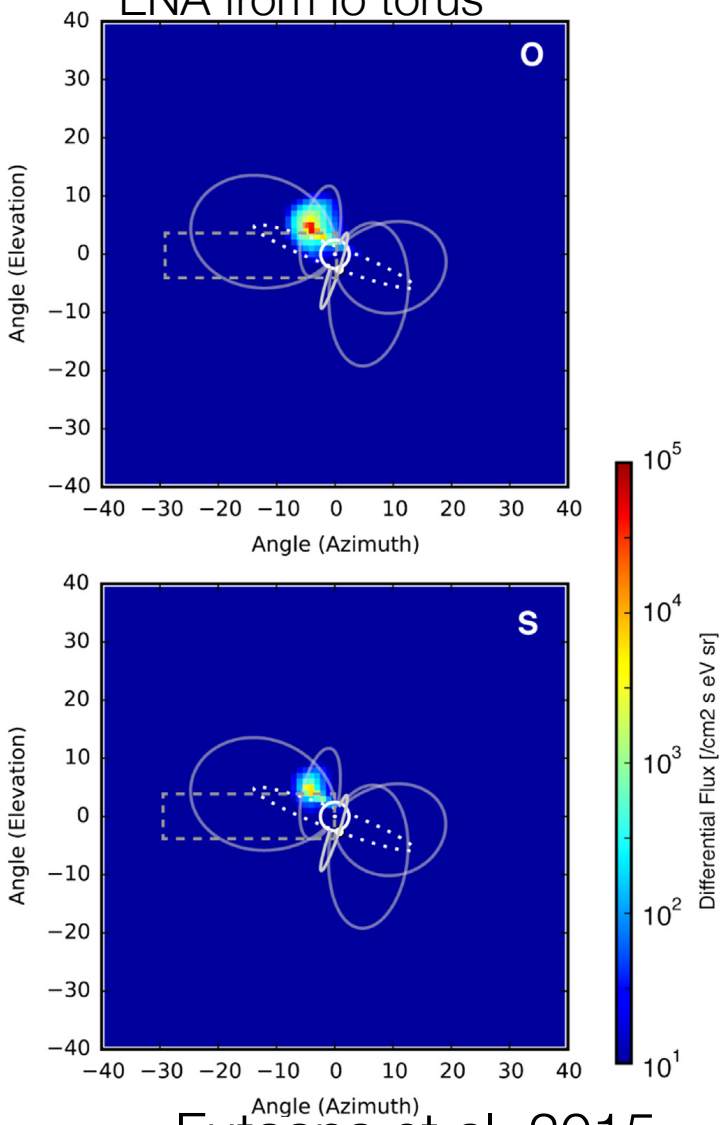
- Ganymede imaging
  - precipitating flux at surface, open-close line, magnetospheric ion–surface interaction (sputtering & scattering)
- Europa/Callisto–surface interaction
- Io torus imaging [Futaana et al. 2015]

Expected low energy ENA from Ganymede derived from the precipitating bulk plasma to the surface using a MHD model [Jia et al., 2009]



Futaana et al. in Preparation

Expected low energy ENA from Io torus

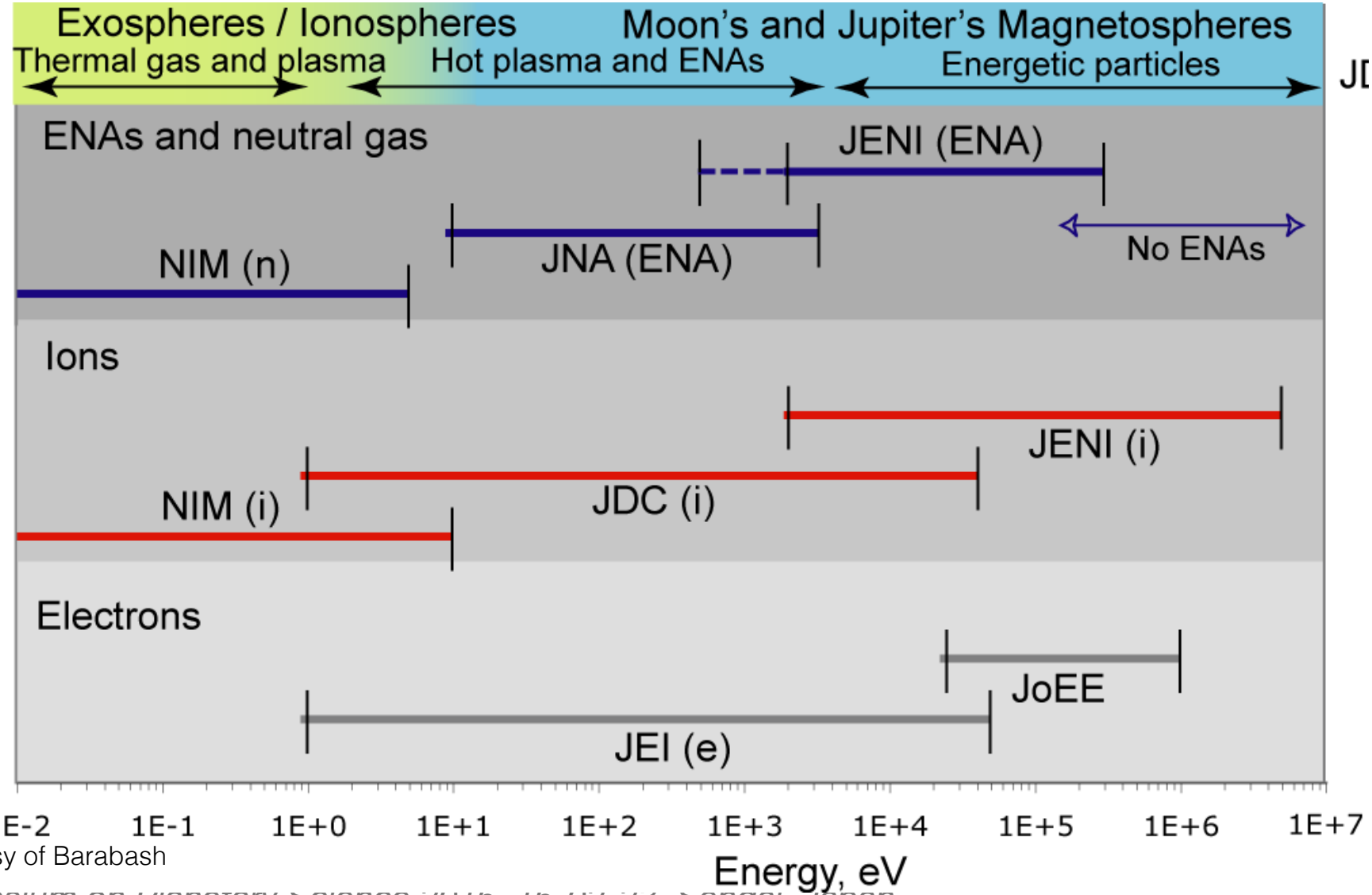


Futaana et al. 2015

see also 遊星人、2015年2月号 p. 113–

PEP: Plasma Environment Package

- With 6 sensors, PEP measures 3D plasma distributions for the full range of energy with 9 orders of magnitude.



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