

LATMOS & LESIA

Europa and Ganymede's interaction with the jovian plasma from hybrid simulation

Claire Baskevitch

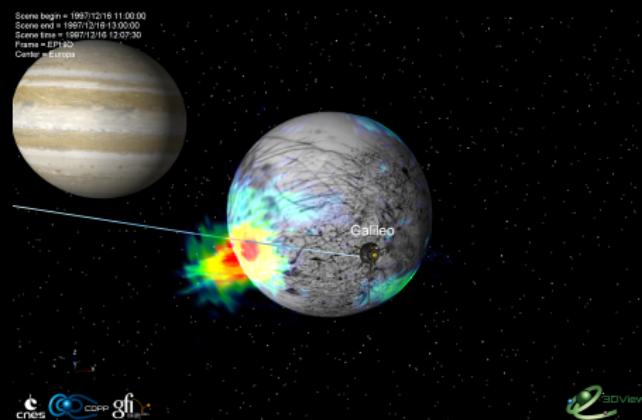
Under the supervision of Ronan Modolo and Baptiste Cecconi

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- Galileo, NASA:
 - jovian system observation : 1995-2002
 - Europa : subsurface ocean, induced magnetic field
 - Ganymede : intrinsic magnetic field, surface constitution
- JUICE (JUpiter ICy moons Explorer), ESA:
 - Launch : 2022, arrival : 2029
 - Europa : 2 flybys, orbit around Ganymede
 - Study : Galilean moons, Jupiter's atmosphere and magnetosphere
- Europa clipper, NASA



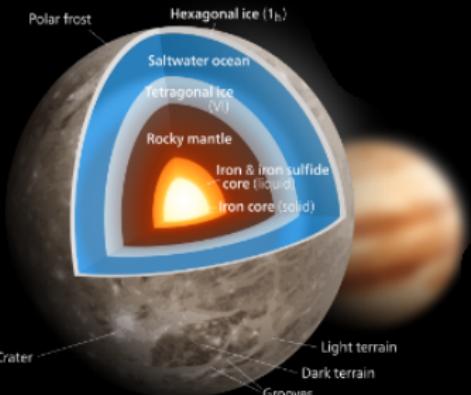
3D multi-species exospheric model with 3Dview (Leblanc et al, in preparation)

Ganymede

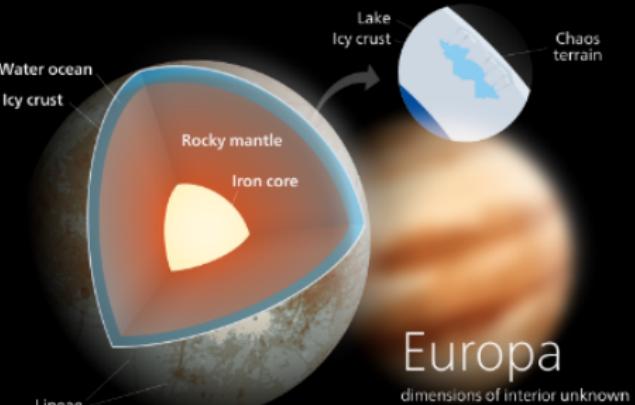
Europa



- Radius : 2634 km
x1.5 Moon's radius
- Orbit at 15 jovian radii
- Intrinsic magnetic field

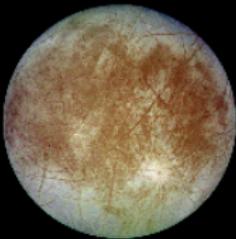


- Radius : 1560 km
x0.9 Moon's radius
- Orbit at 9 jovian radii



Europa

dimensions of interior unknown

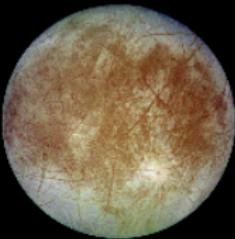


Neutral
Exosphere

- Observations (Galileo, HST)
- 3D multi-species exospheric model
(Turc et al. (Ganymede) and Oza et al. (Europa))

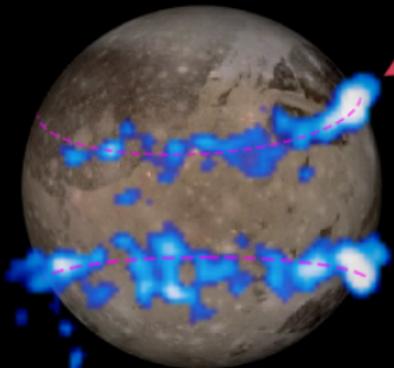
O₂ H₂O H₂

Sublimation
Sputtering
H₂O Dissociation



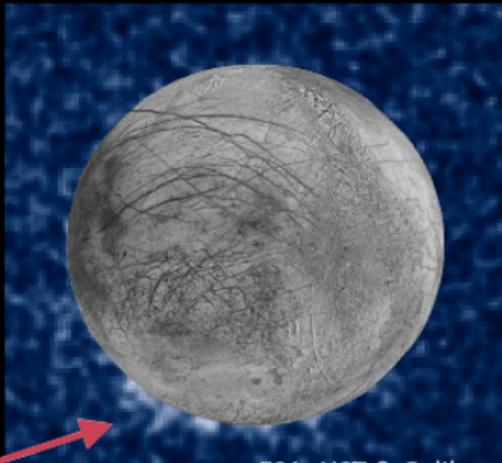
Neutral Exosphere

- Observations (Galileo, HST)
- 3D multi-species exospheric model
(Turc et al. (Ganymede) and Oza et al. (Europa))



NASA, ESA, HST & Galileo

Auroral
belts



Water plumes

ESA, HST & Galileo

Ganymede

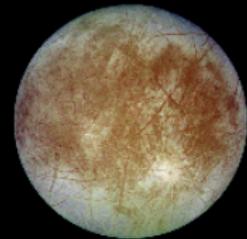
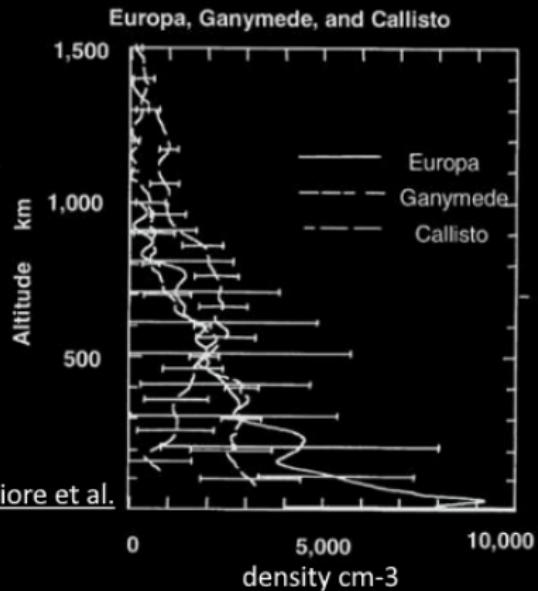
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Europa



- Jovian ions : H+, O+
- Ionosphere : O+
- Density 3.7 cm⁻³
- Velocity 180 km/s
- B field 120 nT

Plasma Environment

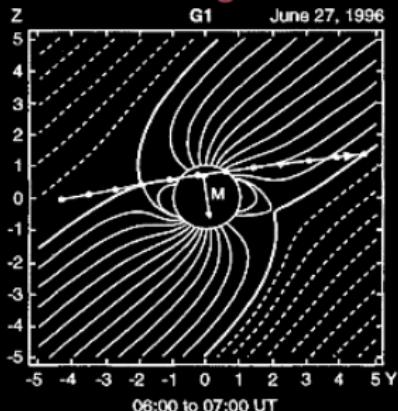


- Jovian ions : SO++
- Ionosphere : O₂++
- Density 130 cm⁻³
- Velocity 85 km/s
- B field 420 nT

Plasma Environment

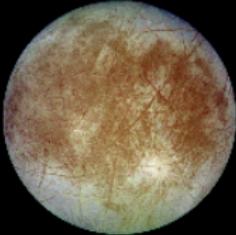


Intrinsic magnetic field
+ Alfvèn wings

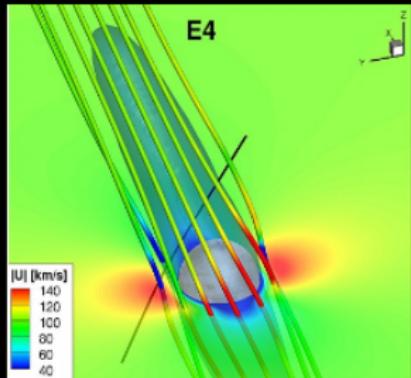


Kivelson et al. (1998)

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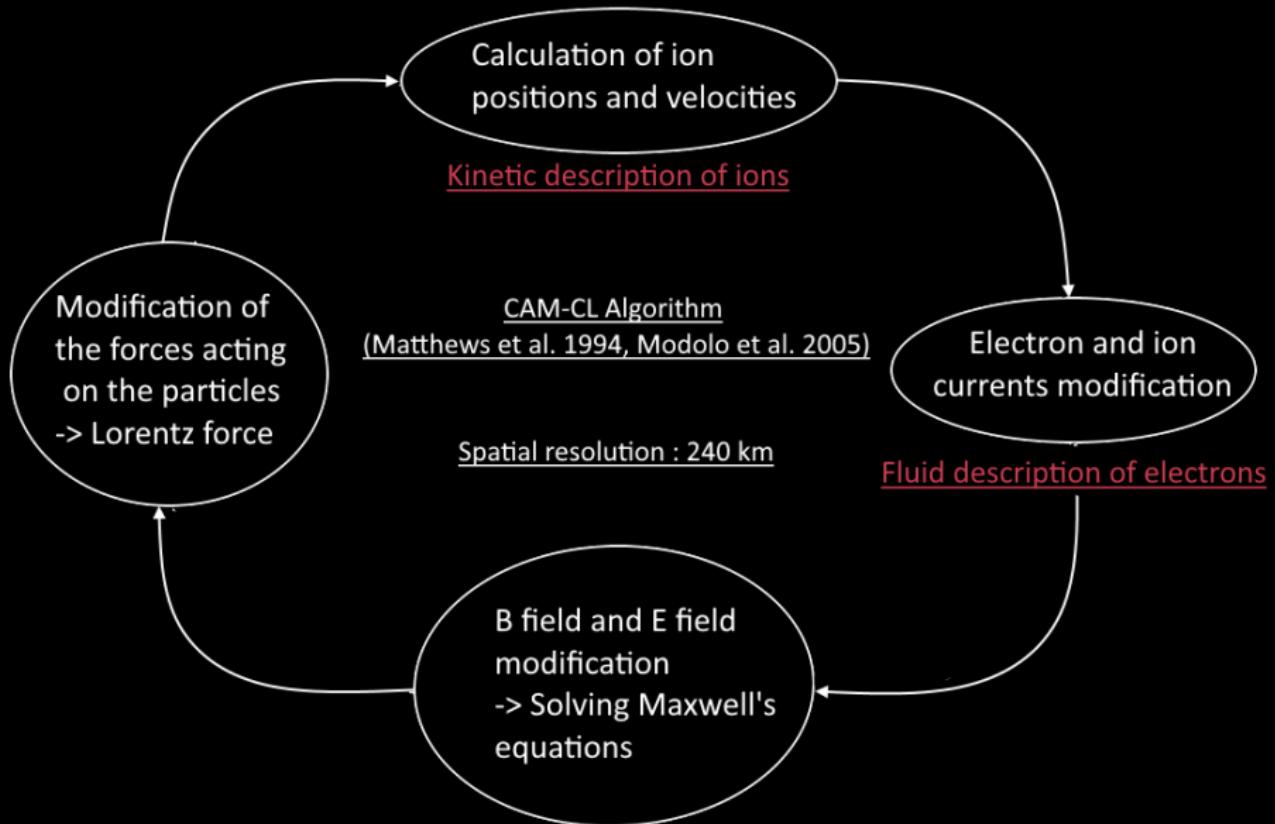
- Plasma torus (Bagenal et al.)
- Induced magnetic field
- + Alfvèn wings



Kabin et al. (2015)

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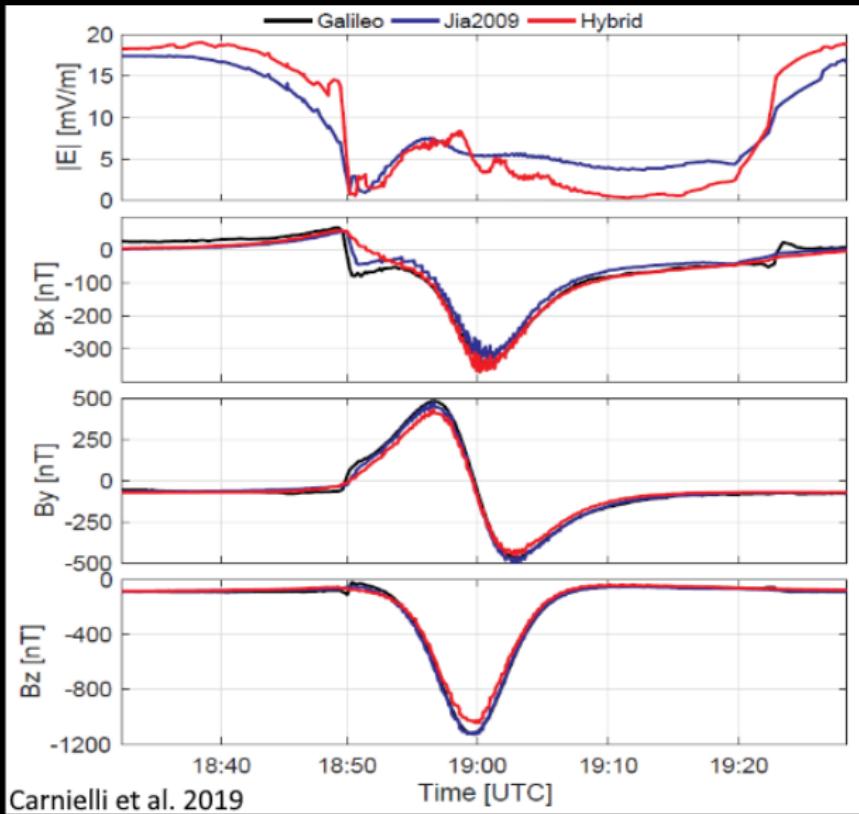
LatHyS : a hybrid model



LatHyS : results for Ganymede



- Galileo G2 flyby
- 3D MHD Model
(Jia et al.)
- 3D LatHyS model
(Leclercq et al.)



Current work and perspectives

- Optimize the simulation in order to refine the results.
 - Reduction of the size of the simulation box -> cell size reduction
 - Periodic conditions not adapted to restricted simulation box
- Add Europa's environment.
 - Plasma : SO++ (Lipatov et al. 2010)
 - Ionosphere : O₂++ (Lipatov et al. and Kliore et al.)

- Thanks for listening !