



<u>The rotation of lo</u> by the Poincaré model



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The Poincaré-Hough model

- Rigid mantle + triaxial fluid core
- 4 degrees of freedom
- Core-mantle coupling
- Parameters :

 J_2 , $C_{2,2}$, size and shape of the core

Modeling Io

From observations :

RIGID MANTLE

FI LIID CORE

- $\rho = 3,527.8 \text{ kg/m}^3$
- $J_2 = 1.8459e-3$
- C₂₂= 5.537e-4
- I = 0.37685 MR^2
- Shape: 1,829.4 km x 1,819.4 km x 1,815.7 km



2 core compositions :

- Fe
 - $\rho = 8,000 \text{ kg/m}^3$
 - $R_c = 650 \text{ km}$
- FeS
 ρ = 5,150 kg/m³
 - $R_{2} = 950 \text{ km}$

Results

| | Librations | Obliquity | Tilt of fluid |
|----------|------------|-----------|---------------|
| Fe core | 30.7 as | 7.9 as | 5 as |
| FeS core | 32.3 as | 8.1 as | 15 as |

Difficult to invert the internal structure from observations.

<u>References</u>

• Noyelles B., Behavior of nearby synchronous rotations of a Poincaré-Hough satellite at low eccentricity, CM&DA, 112, 353-383

• Noyelles B., *The rotation of lo predicted by the Poincaré-Hough model*, submitted, arXiv :1203.3867