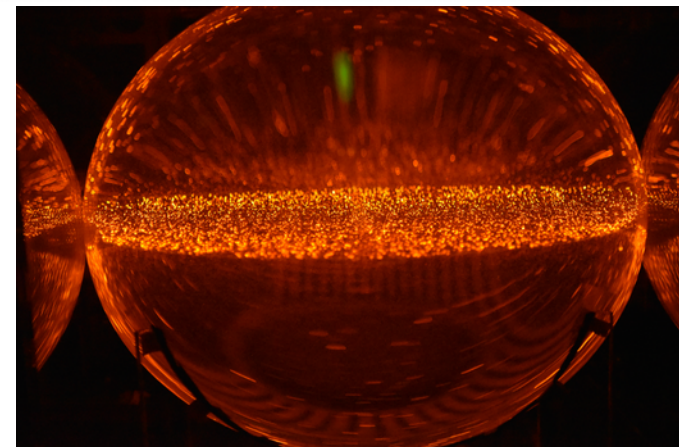
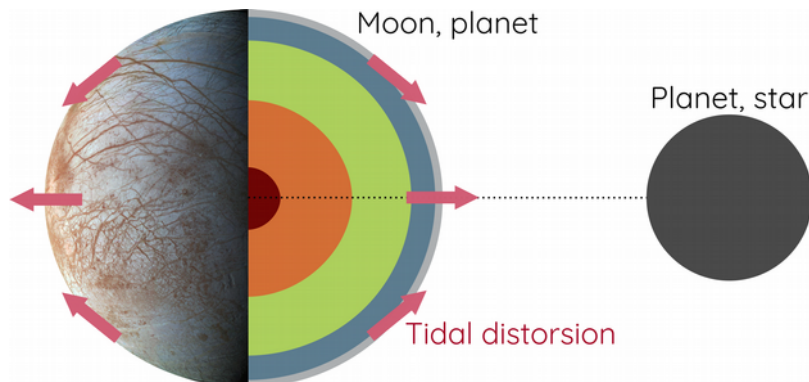
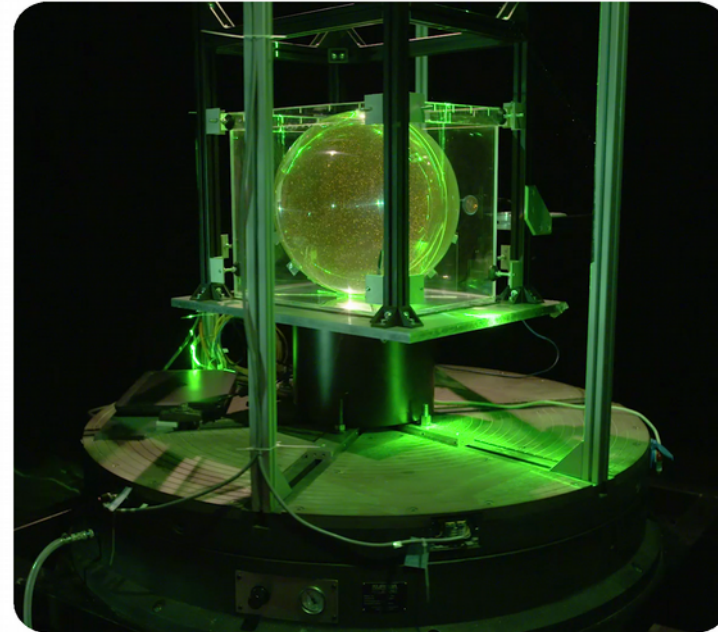
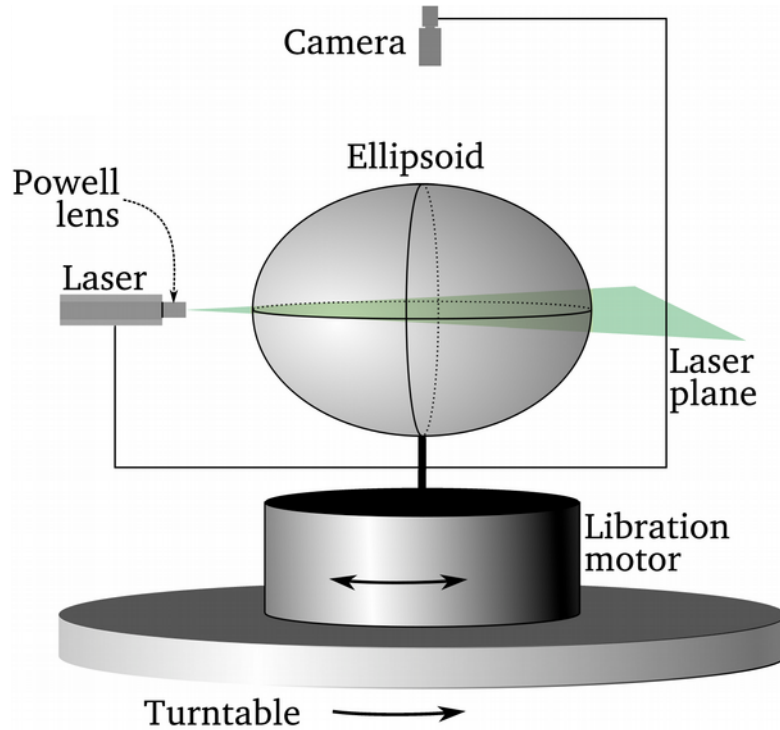


TURBULENCE D'ONDES INERTIELLES GÉNÉRÉE PAR INSTABILITÉ ELLIPTIQUE

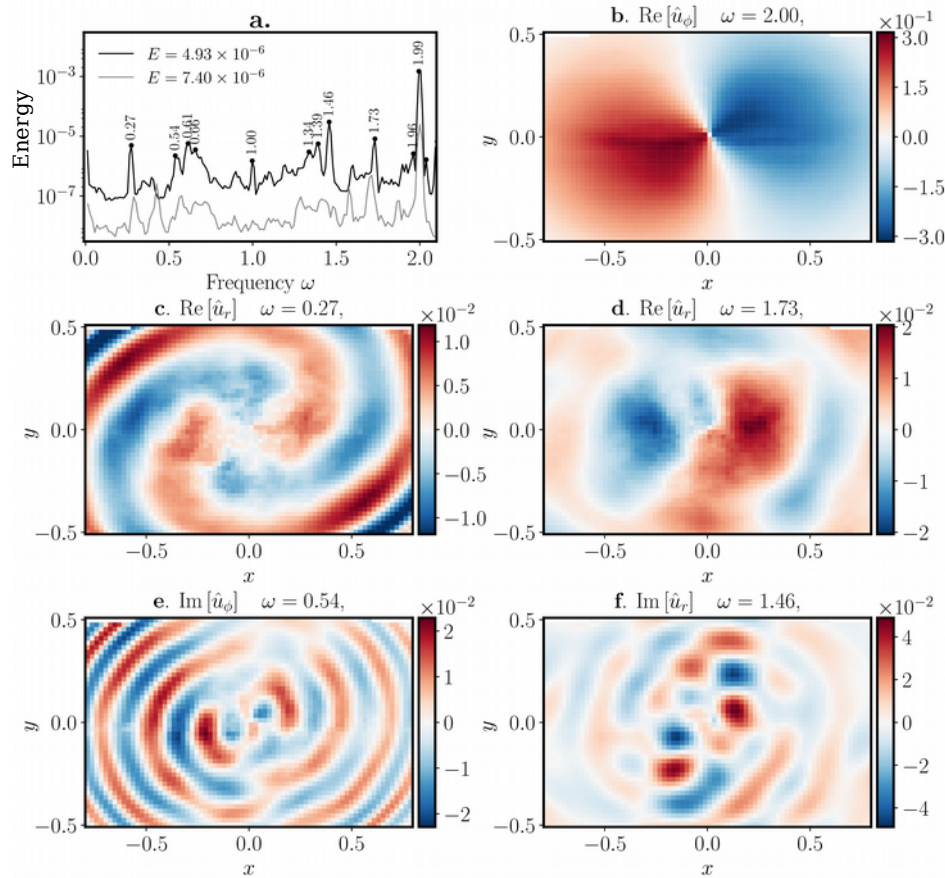
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Résonance paramétrique d'ondes inertielles



Plein d'autres ondes



Le poster à ne pas rater

INERTIAL WAVE TURBULENCE IN PLANETARY CORES

An experimental study

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LIBRATION-DRIVEN FLOWS

Sub-surface ocean
Rocky Mantle
Liquid outer core
Solid inner core

Tidal deformation

Libration base flow (mean rotation frame)
 $U_0^i = \Omega_0 \beta \varepsilon \sin(\Omega_0 t)$

$Ro_i = \beta \varepsilon$ (forcing amplitude)
 β ellipticity

Planet

Gravitational attraction

Torque

Varying rotation rate
 $\Omega = \Omega_0 (1 + \varepsilon \sin(f \Omega_0 t))$

Ω_0 : mean rotation rate
 f : libration frequency
 ε : libration amplitude

Drives inertial wave resonance and turbulence (important for dynamo and dissipation)

THE EXPERIMENTAL SET-UP

Camera
Ellipsoid $a = 25 \text{ cm}$
Powell lens
Laser
Laser plane (PIV measurements)
Turntable
Libration motor

$\Omega_0 = 10 - 30 \text{ RPM}$
 $Ro_i \in [10^{-2}, 10^{-1}]$
 $\beta = 0.33$
 $f = 4$

WAVES IN INTERACTION

Evidence for triadic resonant interactions $\omega_1 + \omega_2 = \omega_{res}$
Filtered velocity fields have mode structures

STRONG GEOSTROPHIC FLOW

Mean flow $U, Ro = 6.20 \times 10^{-2}$

Mean flow rms

Mean flow central vorticity

Secondary instability

REGIME DIAGRAM of the turbulent saturation

Forcing amplitude (Rossby number)

Dissipation (Ekman number)

Stable / Unstable

Geophysics

Our study

Previous works

OPEN QUESTIONS

What kind of dynamo does it drive?

TAKE-HOME MESSAGES

- Periodic libration and tidal distortion excite inertial waves resonance which eventually breaks down into turbulence
- We study the turbulent saturation with experiments
- Low forcing amplitudes lead to inertial wave turbulence
- Increasing the forcing results in a strong geostrophic vortex emerging out of a secondary instability
- Inertial wave turbulence is the relevant regime for planetary cores