3D MHD codes MagIC and Parody

Ludovic Petitdemange[1], Raphaël Raynaud[2],
Paul Barrère[3] & Florentin Daniel[4]

[1]LERMA, Observatoire de Paris; [2]CEA Saclay/AIM, Université Paris Cité; [3]CEA Saclay/AIM, Université Paris-Saclay; [4]LPENS, Université Paris Sciences et Lettres

29th June 2022

Main outlines

1. Introduction
   Speaker: **P. Barrère**

2. Some theory
   Speaker: **R. Raynaud**

3. Numerical methods
   Speaker: **L. Petitdemange**

Coffee break

4. Applications and results
   Speakers: **L. Petitdemange, F. Daniel, P. Barrère**

5. Presentation of the practical training
   Speaker: **P. Barrère**

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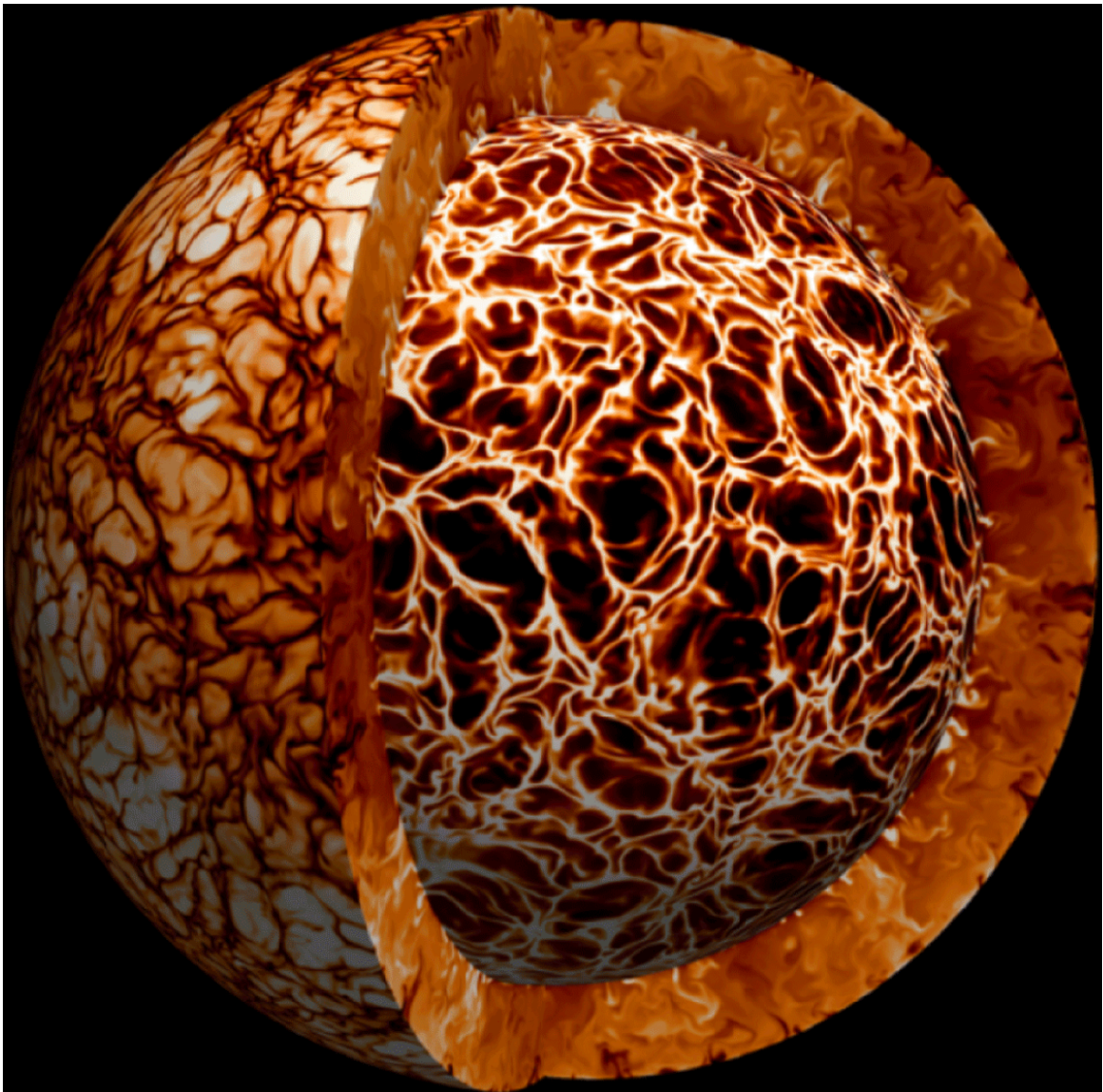## 5. Presentation of the practical training
Speaker: **P. Barrère**
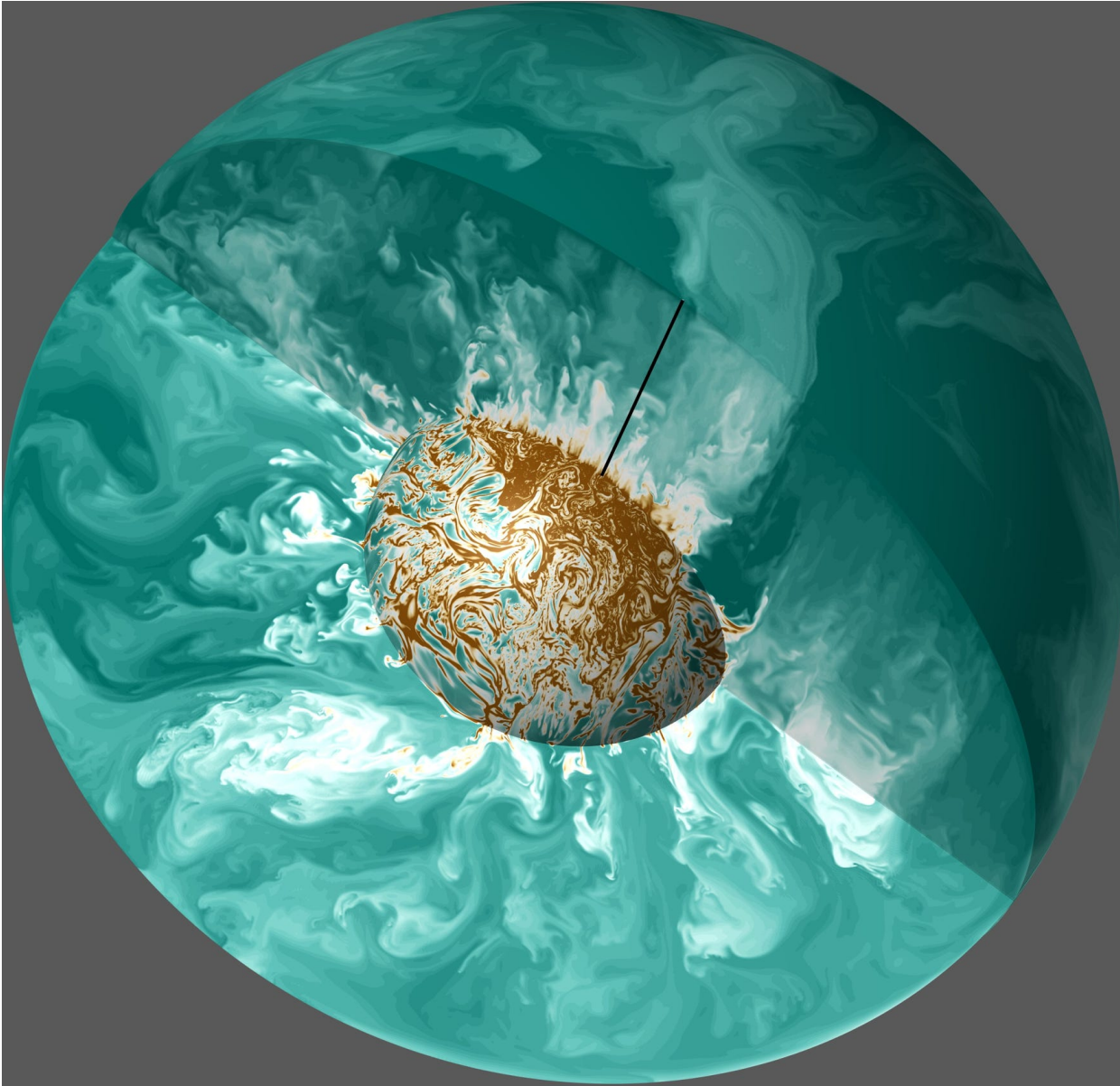
Spherical Couette flows
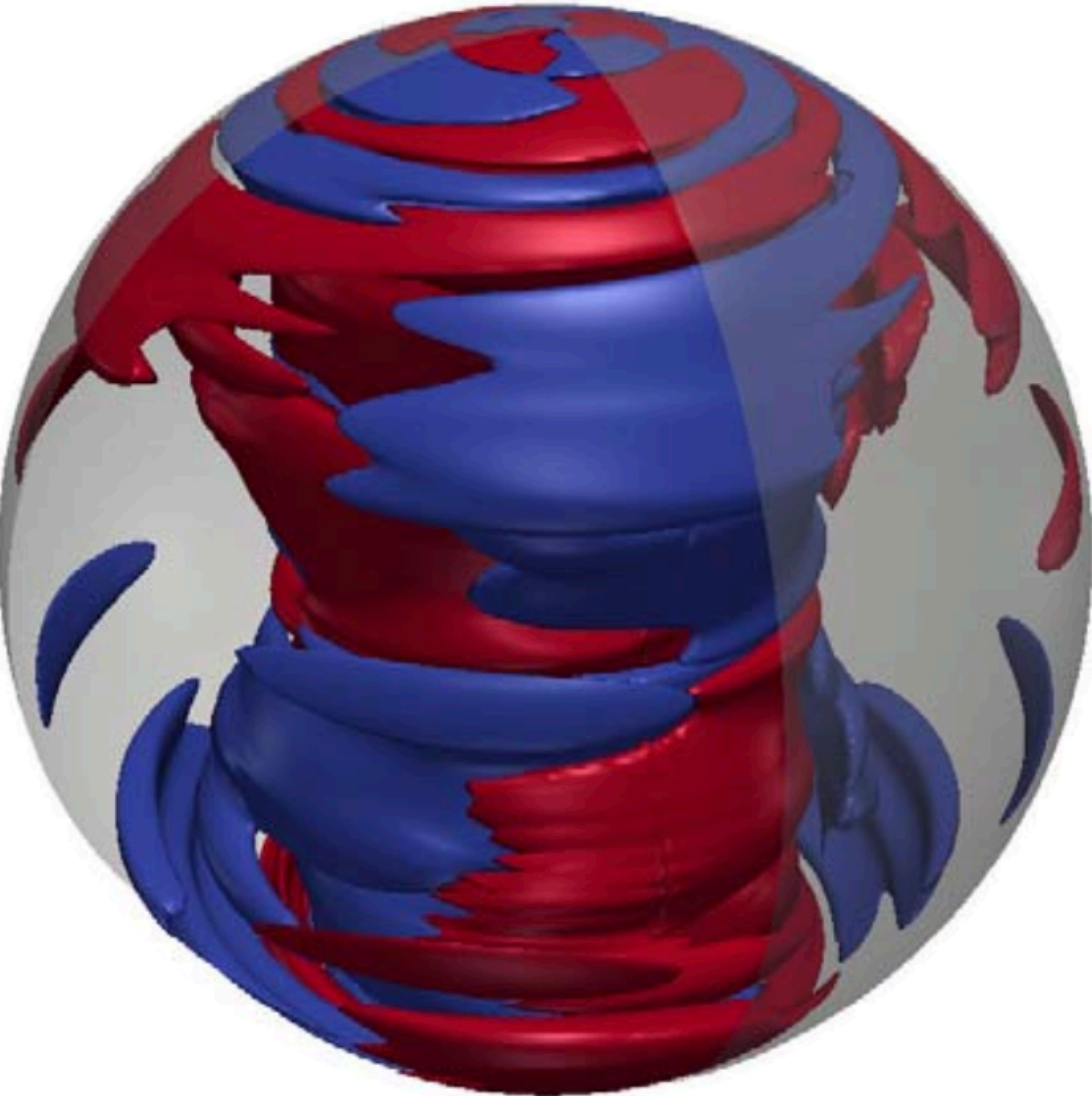
Barik+18

Rayleigh-Bénard convection

Gastine+15

Convective dynamo

Aubert+19

Magnetorotational Instability (MRI)
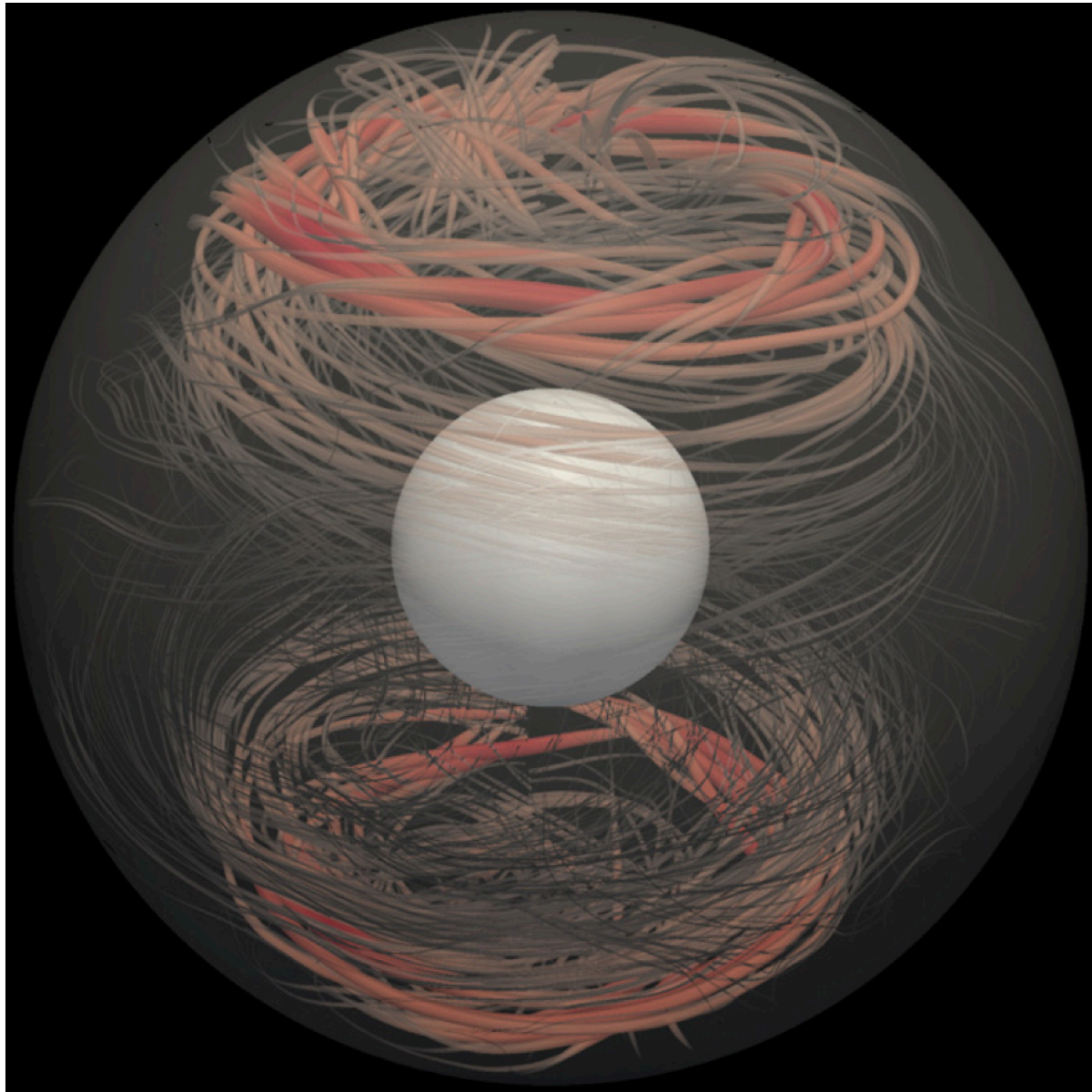
Jouve+15

Planetary & geophysics
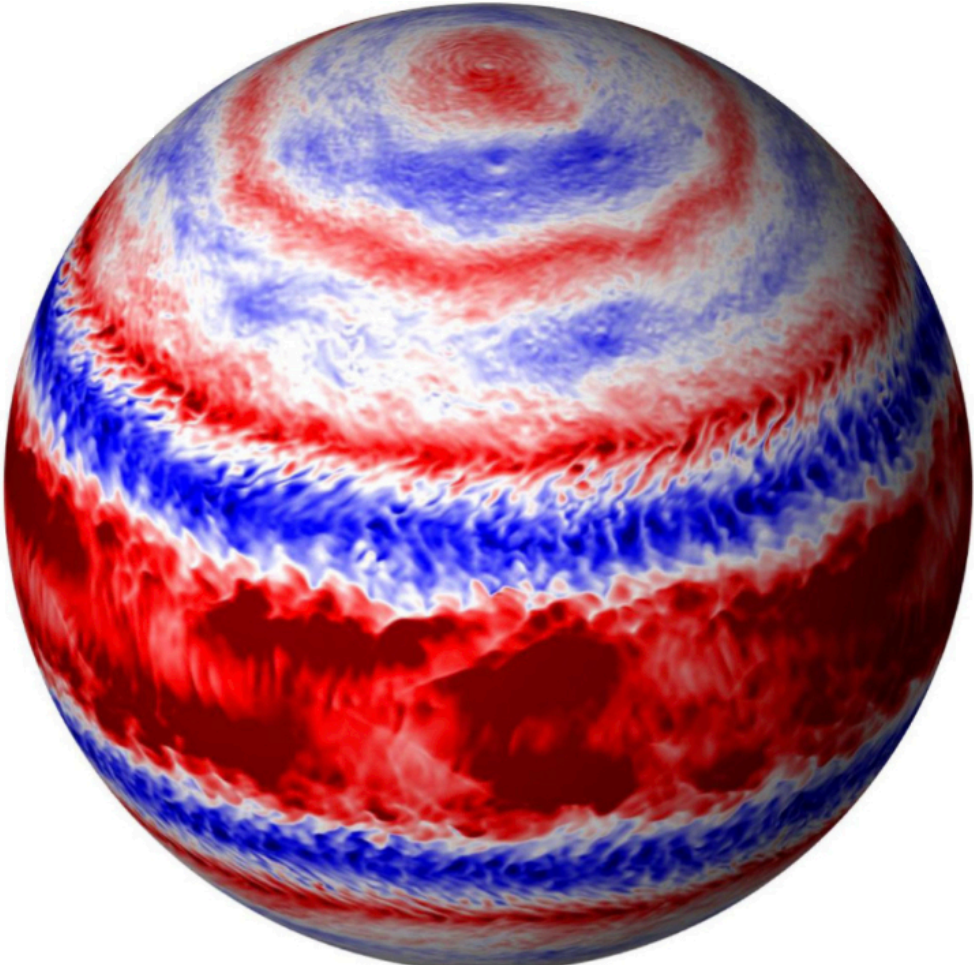
Heimpel+22

Aubert+08
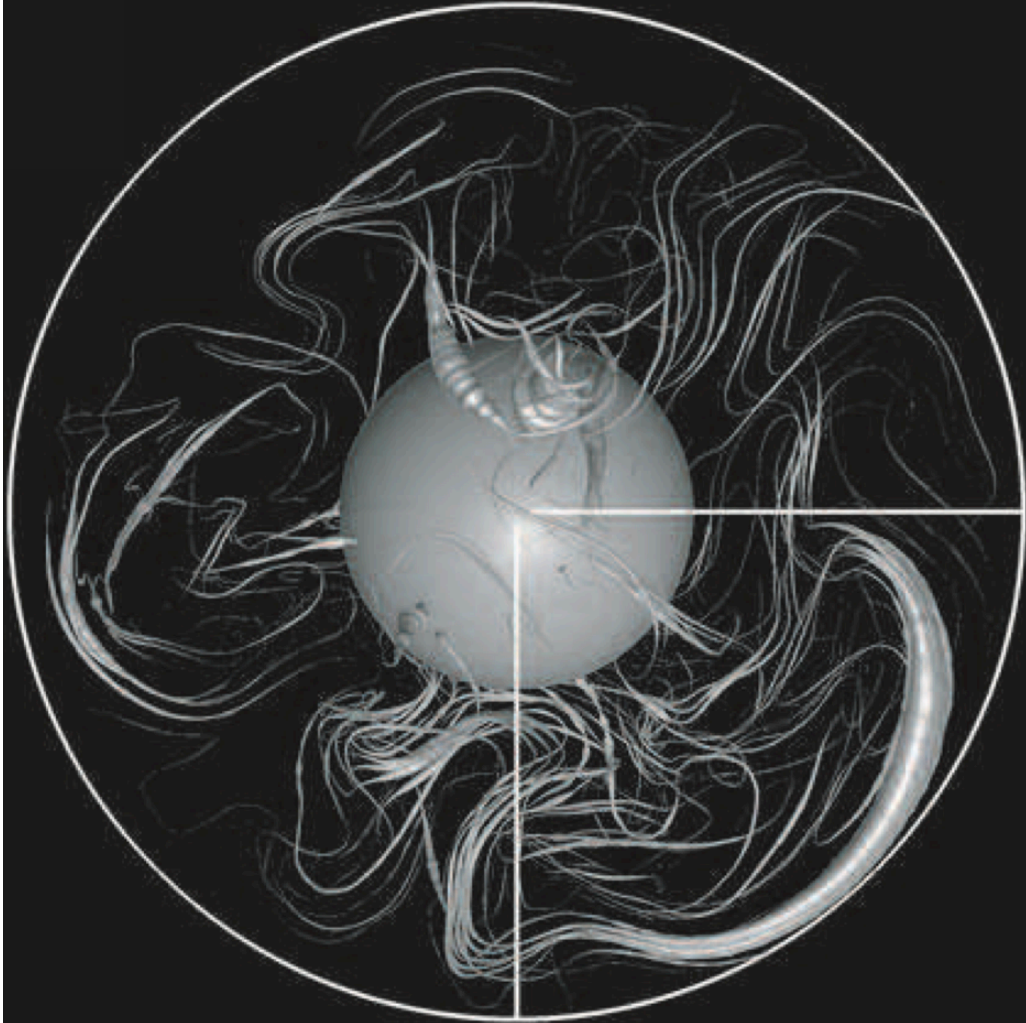
Stellar physics
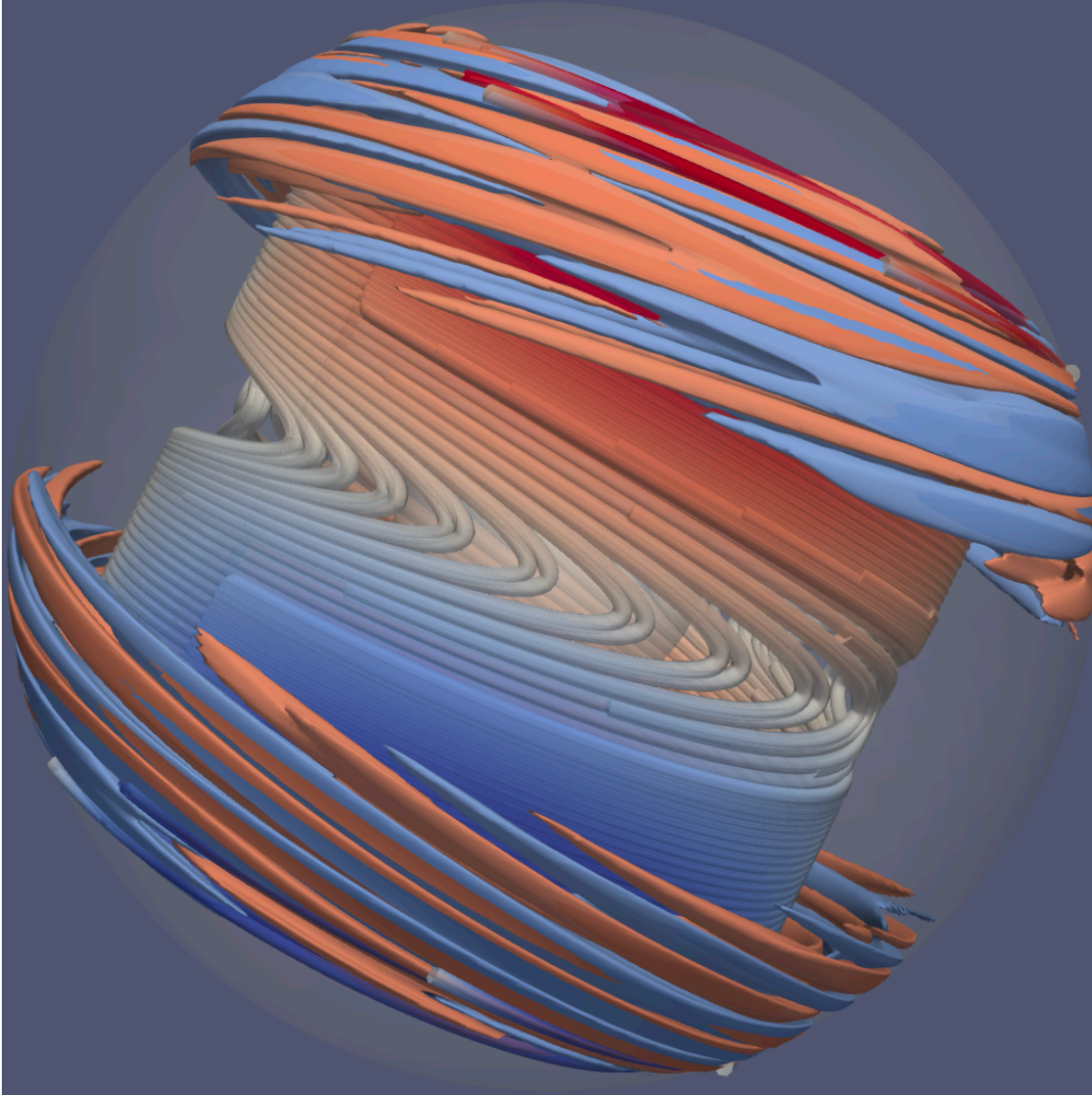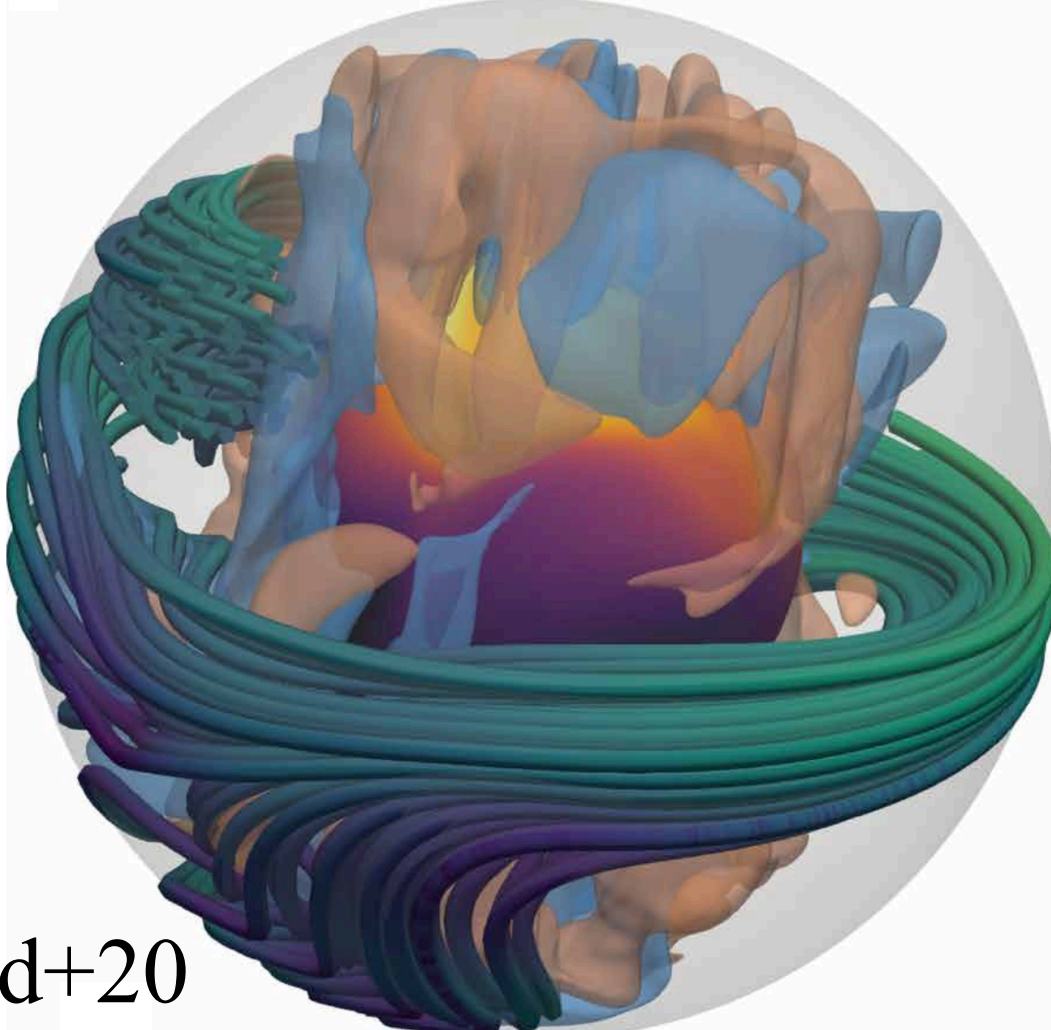

Jouve+20

Magnetar formation
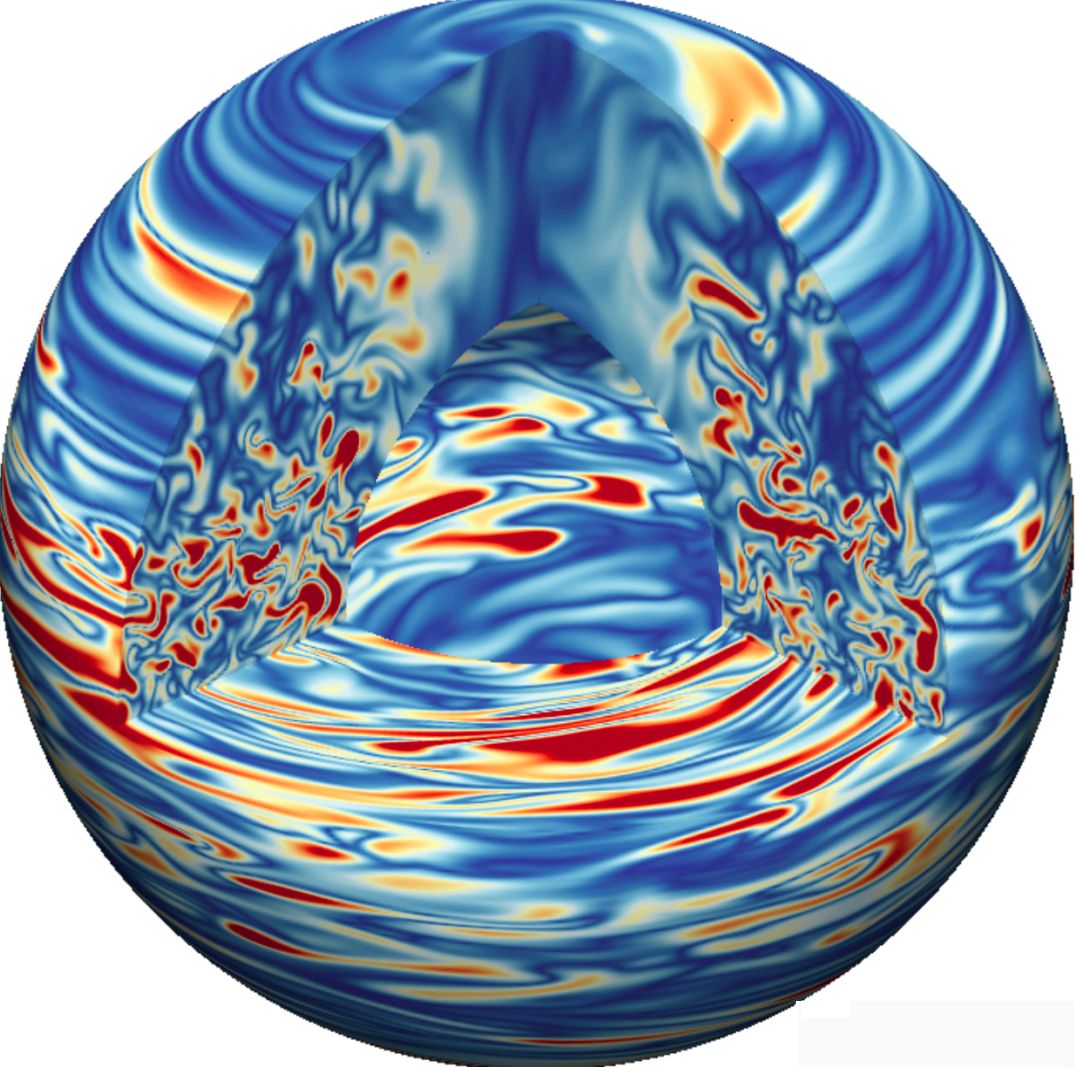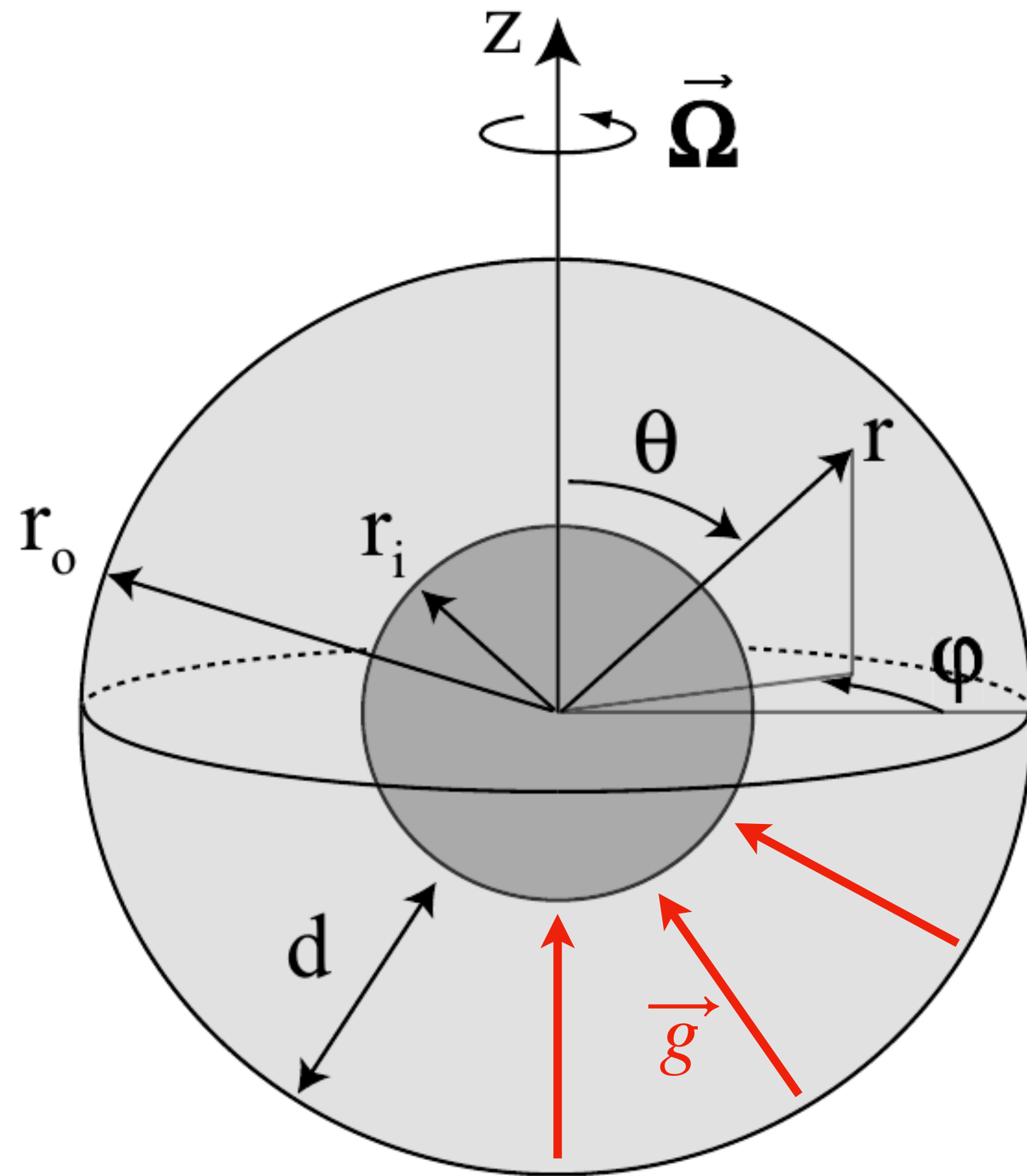

Reboul-Salze+21

Raynaud+20
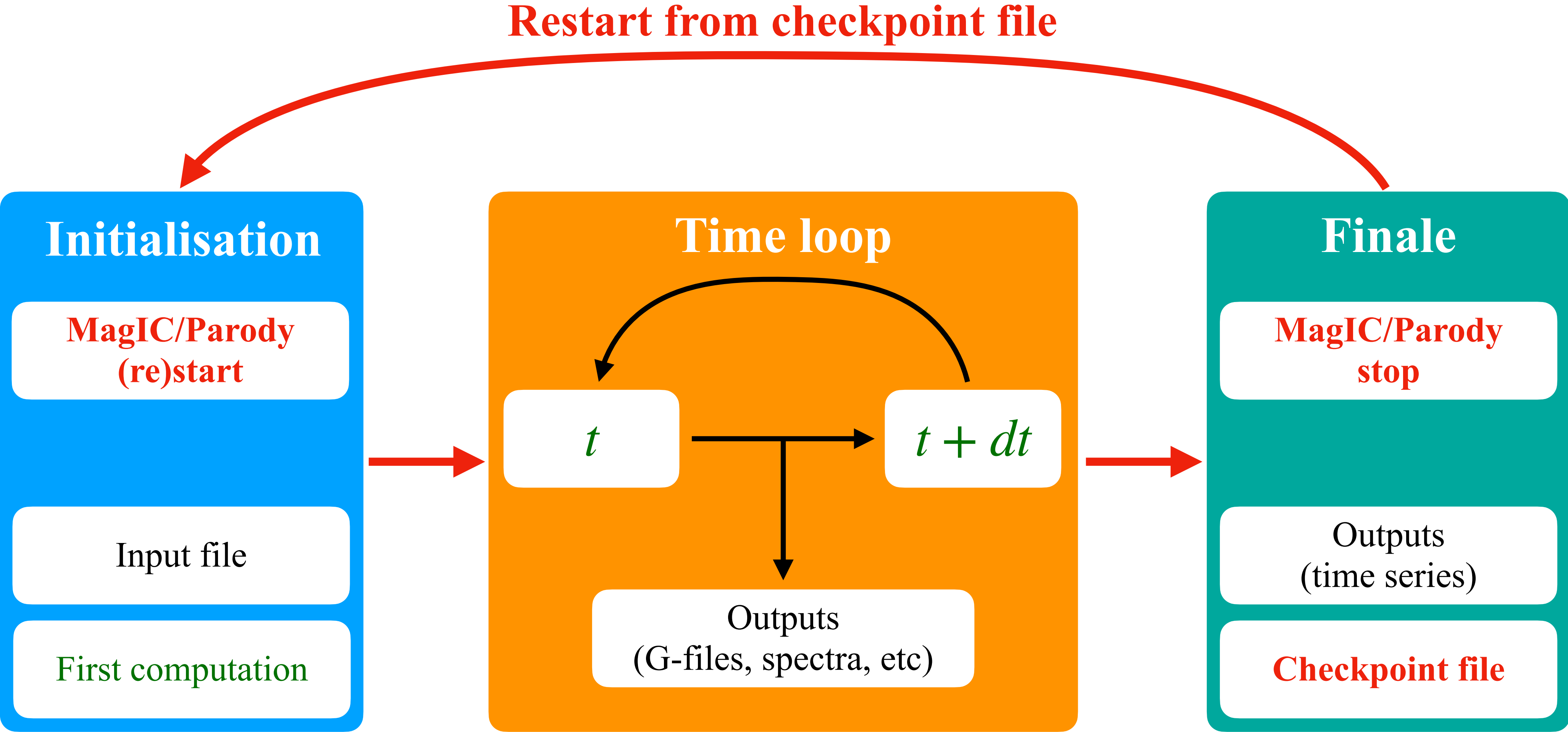
Frame of reference rotating with the system rotation

Boundary conditions

- **Mechanical conditions:**
  1. No-slip
  2. Stress free
- **Magnetic conditions:**
  1. Insulating
  2. Perfectly conducting
  3. Finitely conducting
  4. Pseudo-vaccum
- **Thermal:**
  1. Fixed temperature
  2. Fixed temperature gradient
- **Chemical:**
  1. Fixed composition
  2. Fixed composition gradient

Restart from checkpoint file

Initialisation

MagIC/Parody (re)start

Input file

First computation

Time loop

t → $t + dt$

Outputs
(G-files, spectra, etc)

Finale

MagIC/Parody stop

Outputs
(time series)

Checkpoint file

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