

# EVOLUTION OF THE CONSTITUENT MATERIAL OF LLSVP-LIKE $V_s$ ANOMALIES IN MANTLE CIRCULATION MODELS

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## I MOTIVATION

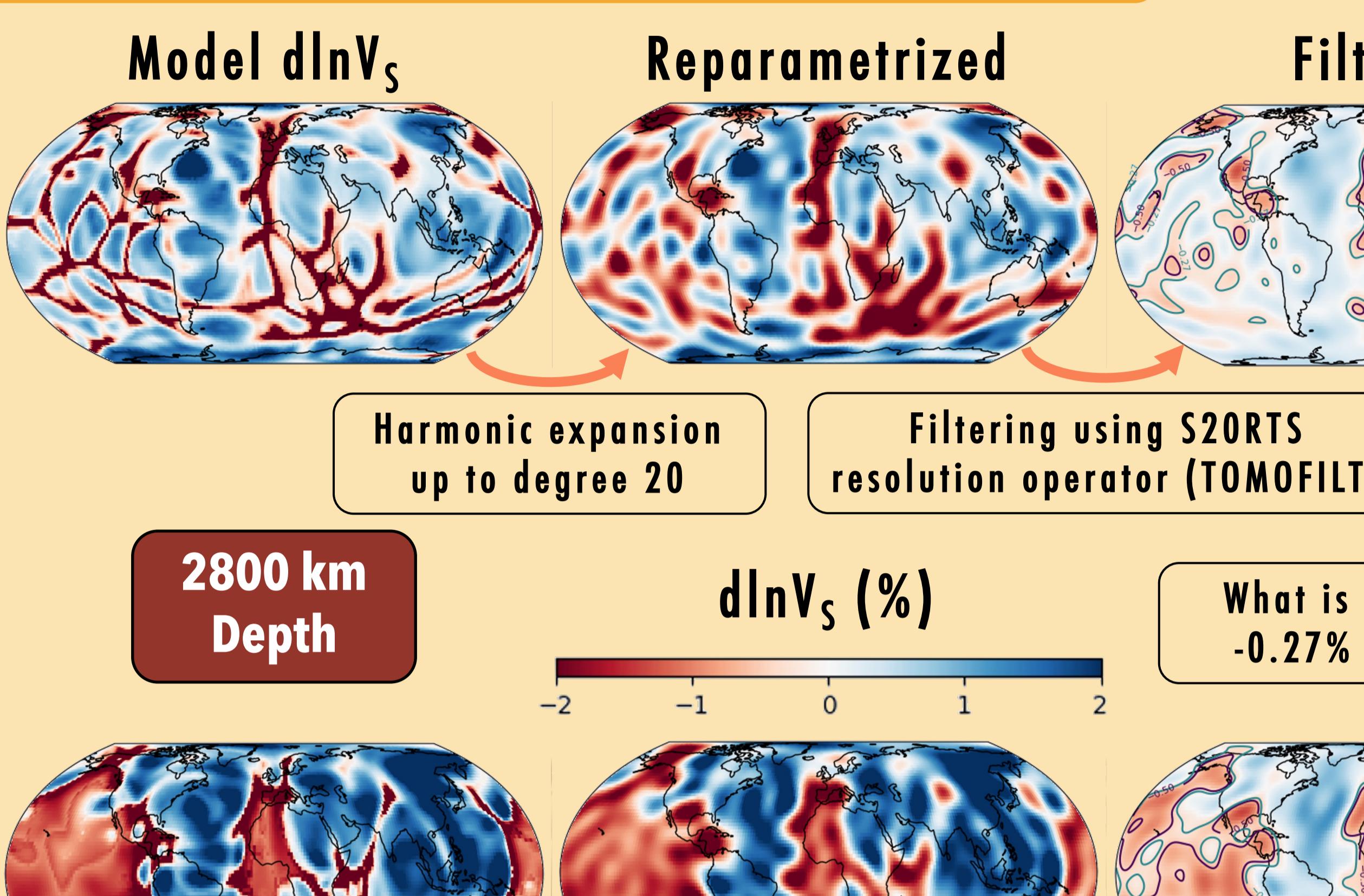
- LLSVPs are **basal mantle structures** located beneath the Pacific and Africa, which are defined by their **negative anomaly** in  $d\ln V_s$
- Are LLSVPs purely thermal?
- Are **LLSVPs a reservoir for the primitive mantle?** Long-lived stable structures?
- We aim to track the **evolution** and **composition** of LLSVP-like material in mantle circulation models

## II METHODS

- Using **TERRA** [1,2], we produce **compressible thermo-chemical mantle circulation** models (imposed surface velocities [3]), with **temperature dependent viscosity and melting**
- Following [4], we generate  $V_s$  from model's **Depth, Temperature and bulk Composition**
- Using **TOMOFILT** [5], we simulate the effect of the tomographic filter

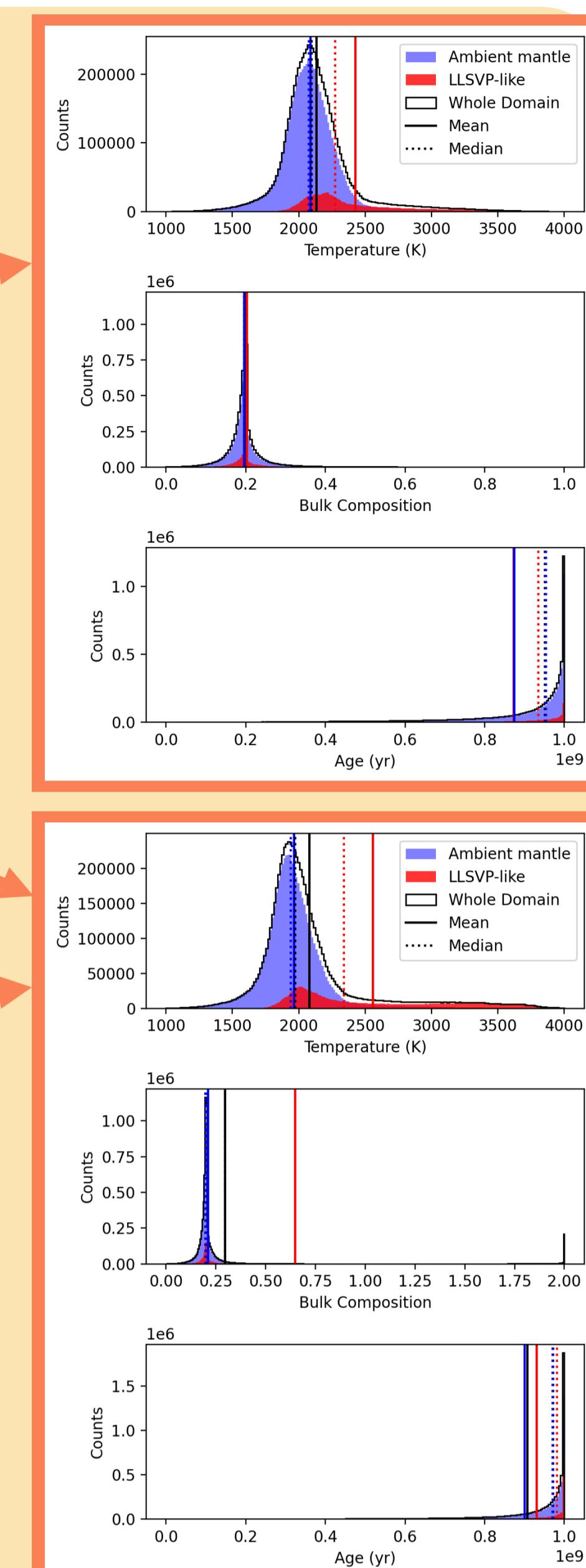
## III CONSTITUENT MATERIAL OF LLSVPs

reference



prim\_layer

- Material within models' LLSVPs is warmer than ambient mantle
- In the primordial dense layer case, the primordial material concentrates within LLSVPs, increasing the mean bulk composition



## VI TRACKING LLSVP-LIKE ANOMALIES AND CONSTITUENT MATERIAL

reference

prim\_layer

Selecting the same percentage of values of the REPARAMETRIZED  $d\ln V_s$  field

Convert -0.27% contour into percentile rank

ref: 14.25%

prim: 19.9%

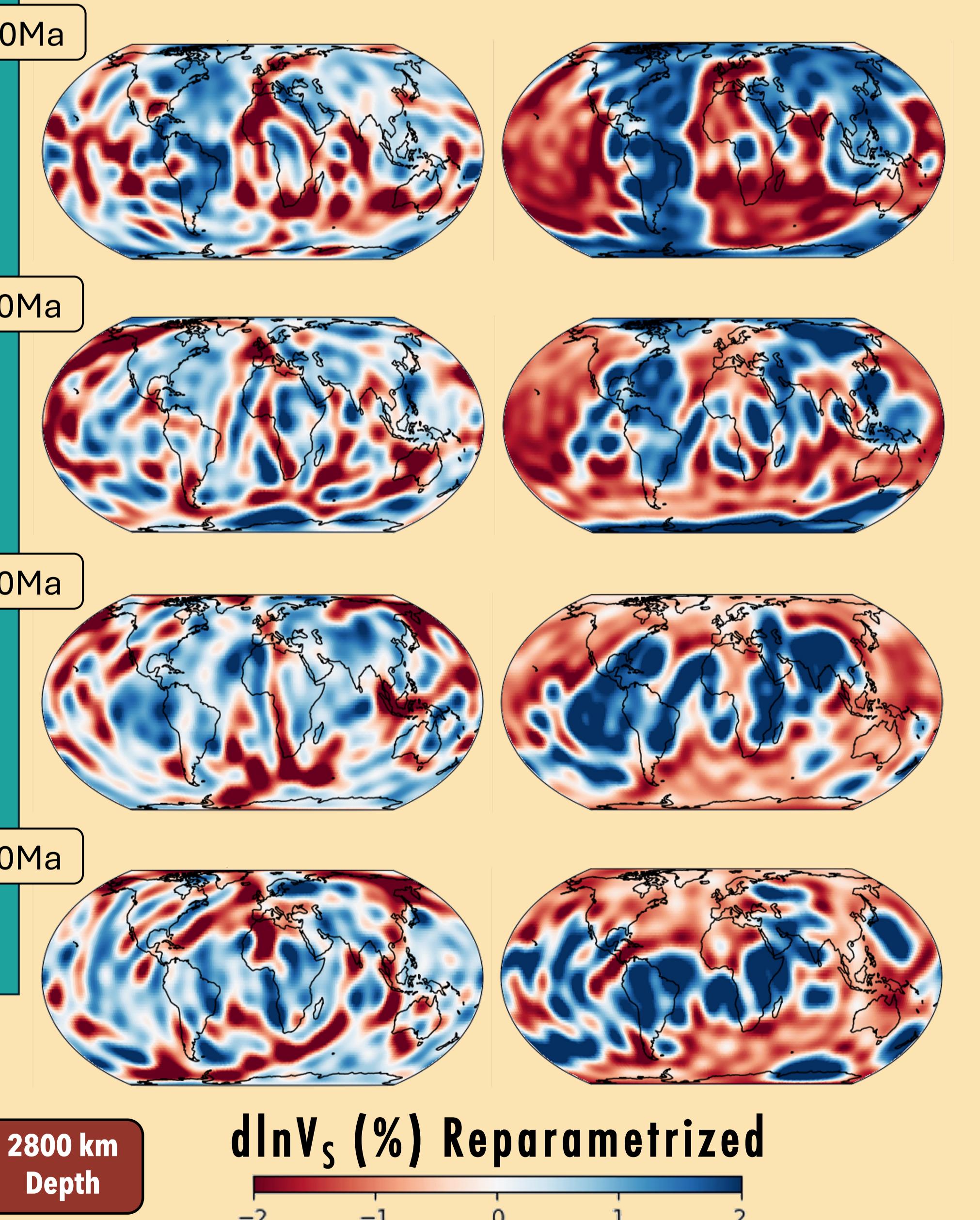
- LLSVP-like material is hotter than ambient mantle throughout the simulation in both cases
- In the primordial dense layer case, the dense material is kept within negative  $V_s$  anomalies
- In both cases, LLSVP-like material is mobile, the plate motion history is a primary control of the location of the structures

## V PRIMORDIAL MATERIAL STORED IN LLSVPs ?

Isosurface shows  $d\ln V_s = -1\%$   
Model  $d\ln V_s$  (NOT reparametrized or filtered)

Isosurface coloured by percentile rank of  $^{3}\text{He}/^{4}\text{He}$ .  
Values close to 1 are therefore the most primordial signatures

reference  
prim\_layer



## FUTURE WORK

- Output distributions on the particle/tracer scale, it could highlight a greater diversity than on the node scale
- Test other cases such as purely thermal and high basalt buoyancy number (here  $B=0.44$ )
- Apply method to long convection models (5Gyr) to test survival of primordial material and its potential link with negative  $V_s$  anomalies throughout the simulation

## REFERENCES

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