

# Review of “Seismostratigraphy and Thermal Structure of Earth's Core-Mantle Boundary Region ”

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# Summary

- Positive and negative reflections of ScS corresponds to boundary from pv to ppv and from ppv to pv, respectively.
- There is a ppv lens beneath North America indicating that D'' is cold because of slab.
- Combining with phase boundary between perovskite (pv) and post-pv of  $\text{MgSiO}_3$ , temperature at CMB is estimated  $3950 \pm 200\text{K}$ .

# Technique

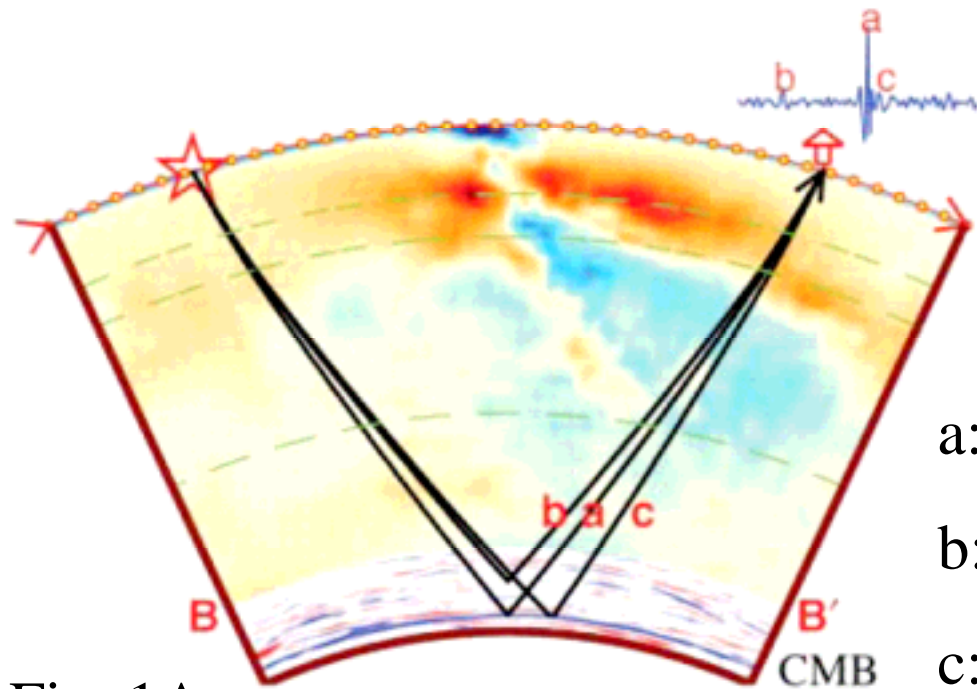
- Inverse scattering and generalized Radon transformation (GRT) with ScS wave (Fig. 1A)

Radon transformation: Projection from a arbitrary position (line integral)

## Reflection interface (Fig. 3)

- L1: presumed top of D'' (transition from pv to ppv with depth)
- L2: transition from ppv to pv with depth
- L3: ??? (slab folding? multipul crossing? )

A



a: symmetric ScS reflection

b: S wave reflected in D'' (SdS)

c: asymmetric ScS reflection

Fig. 1A

## ref. seismic wave naming

P: P wave propagating in crust or mantle

S: S wave propagating in crust or mantle

K: P wave through the outer core

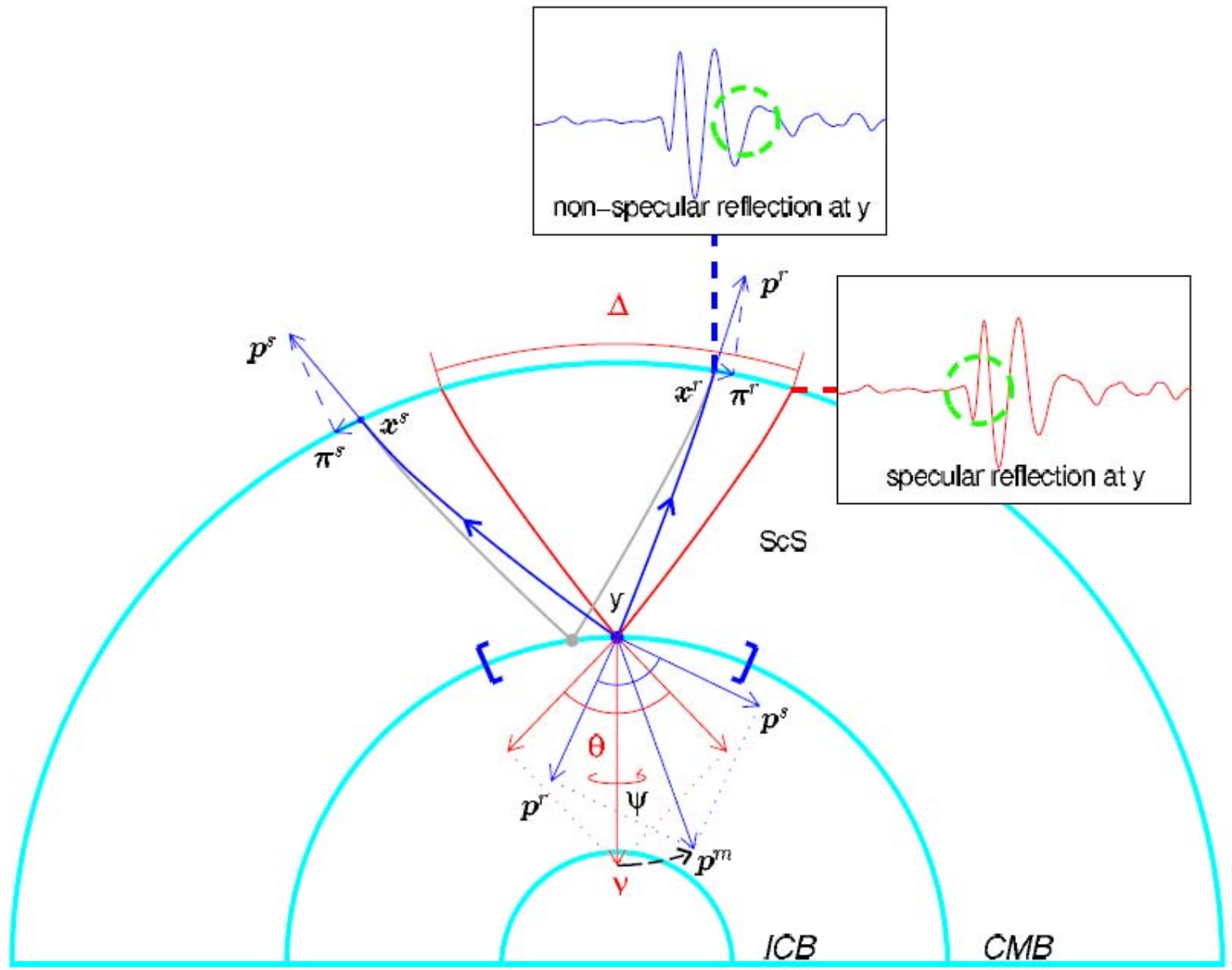
I: P wave through the inner core

p: P wave injected upward from the source

s: s wave injected upward from the source

c: Reflection at core mantle boundary

i: Reflection at inner core boundary



A

Fig.1 of Wang et al. (2005) 5

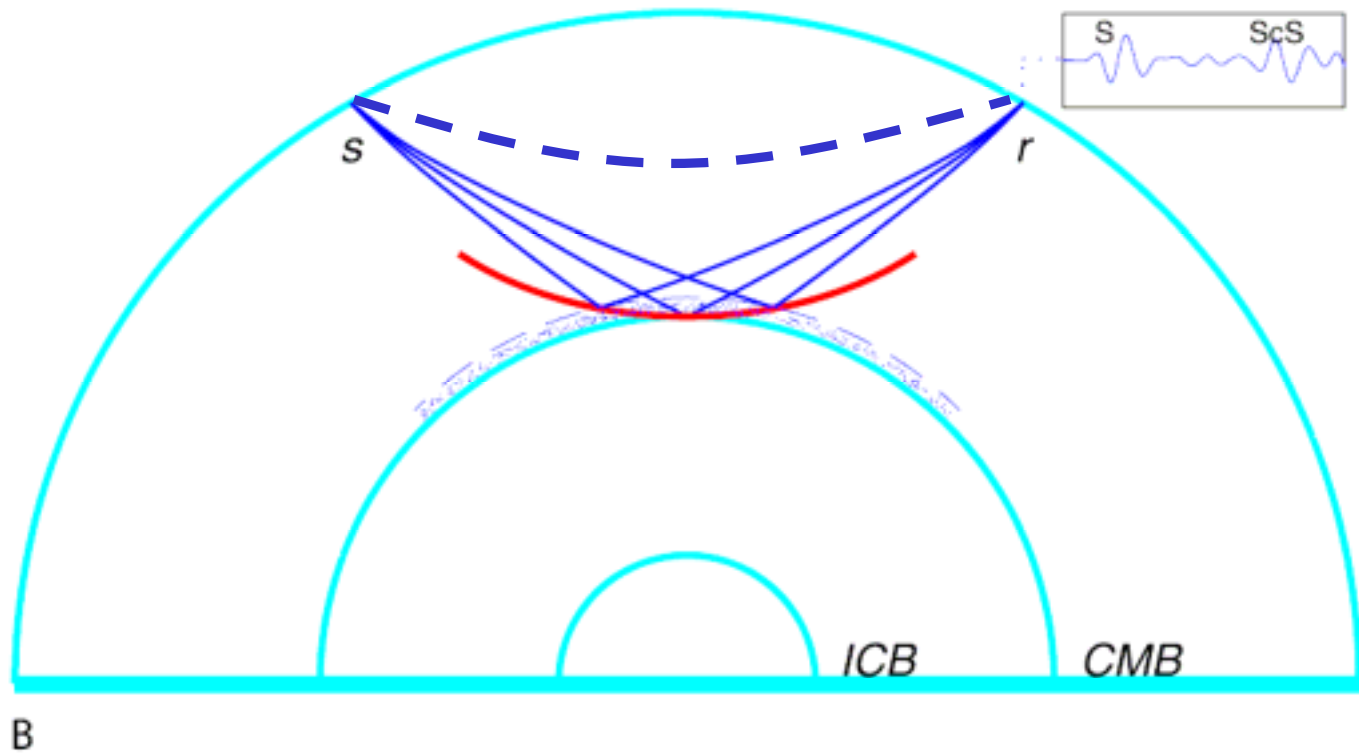


Fig.1 of Wang et al. (2005)

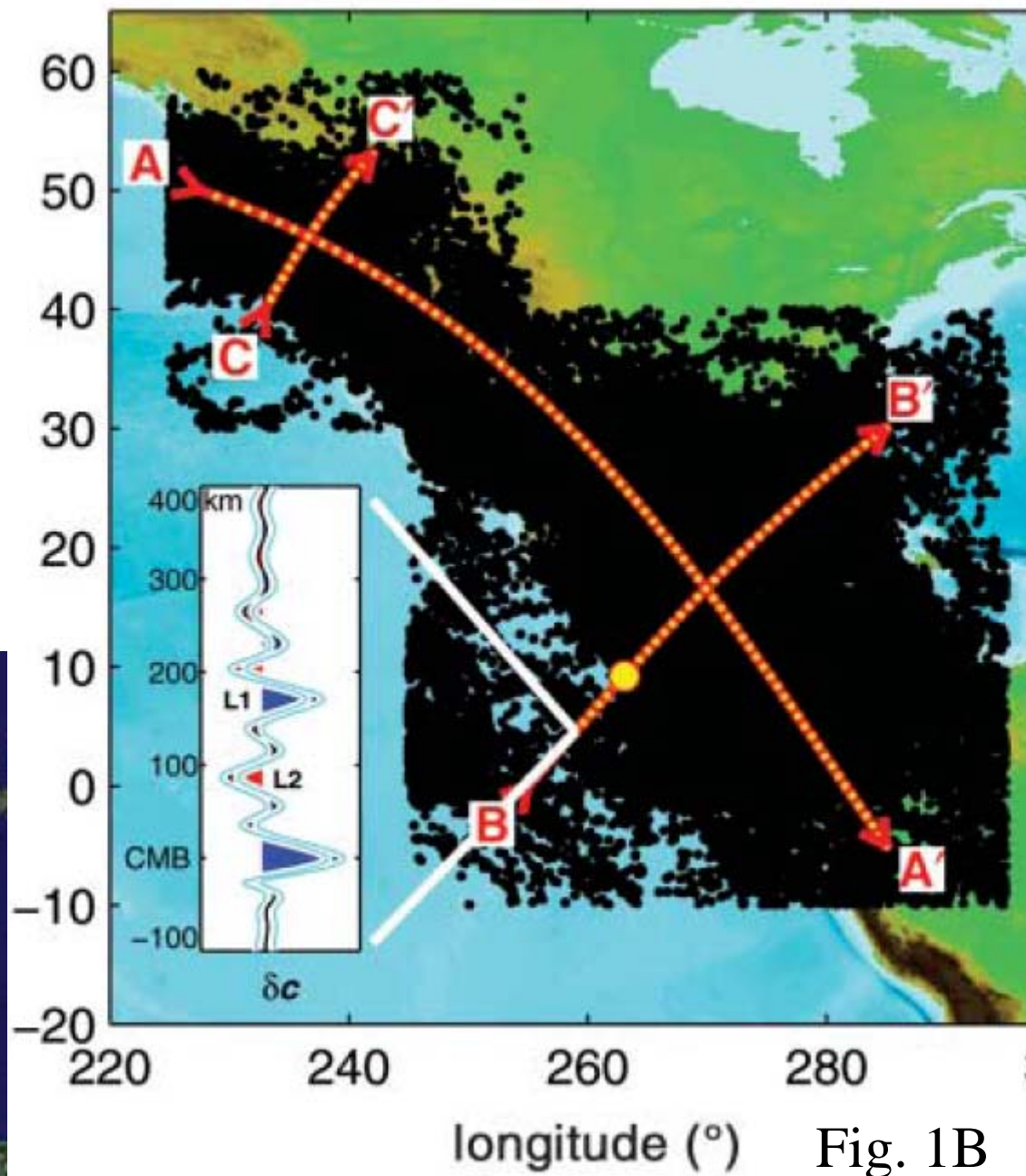
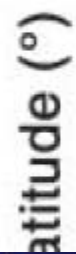
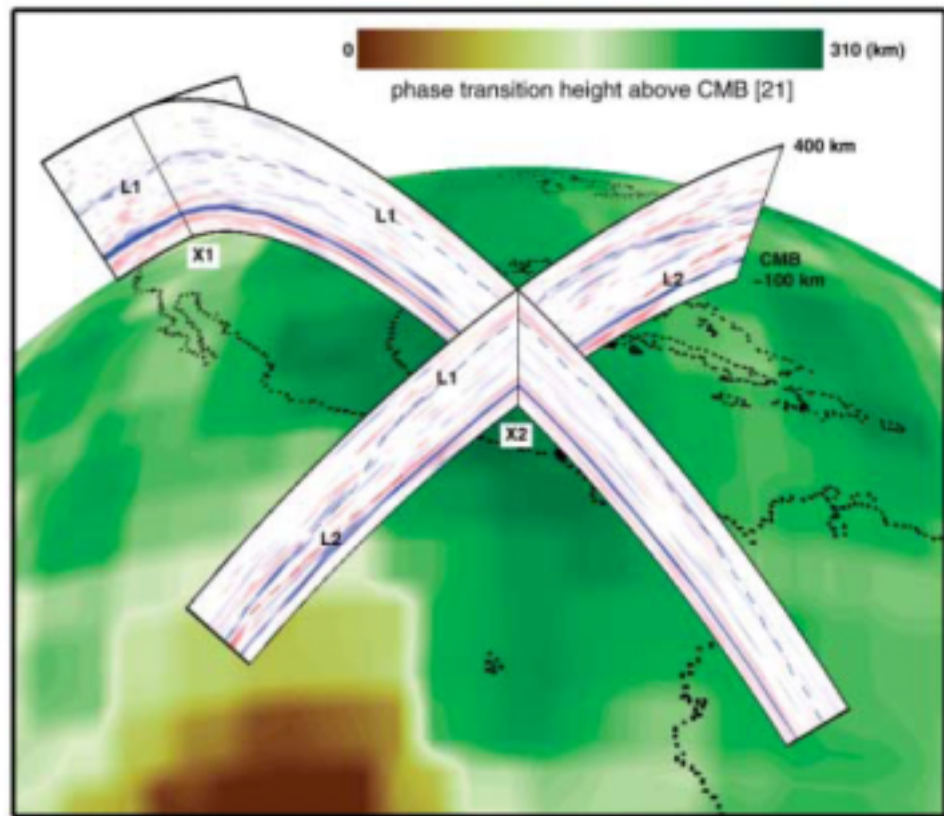


Fig. 1B



**Fig. 2.** Three-dimensional exploration seismology of the lowermost mantle. Seismic images of the lowermost mantle (CMB to 400 km above it) are produced by lateral juxtaposition of radial general Radon transform profiles (fig. S2) calculated at image points along the section lines shown in Fig. 1. Structure outside 75% confidence bands (18) includes the CMB (at 0 km) and several scatter interfaces above it. Thinly dashed lines indicate scatter interfaces (L1, L2) highlighted in Fig. 3. This 3D rendition illustrates the large spatial scales over which inverse scattering with the ScS wave field can be used to explore the lowermost mantle. Points X1 and X2 indicate the section intersections.



4/19 The background color depicts the prediction of the height above the CMB of a presumed phase transition with a Clapeyron slope of 6 MPa/K (21). In most of this region, the correlation between L1 and the predicted values is very good.



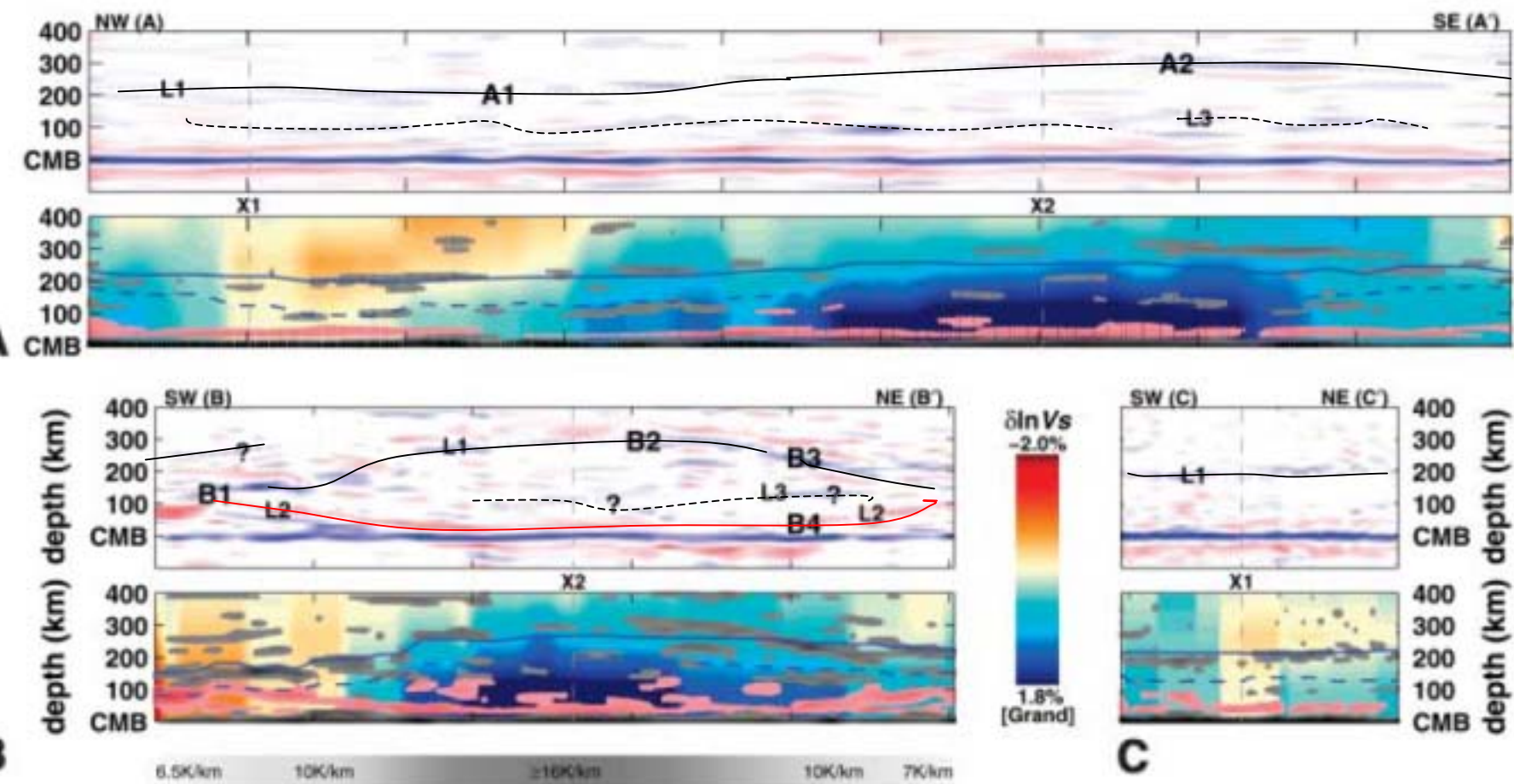
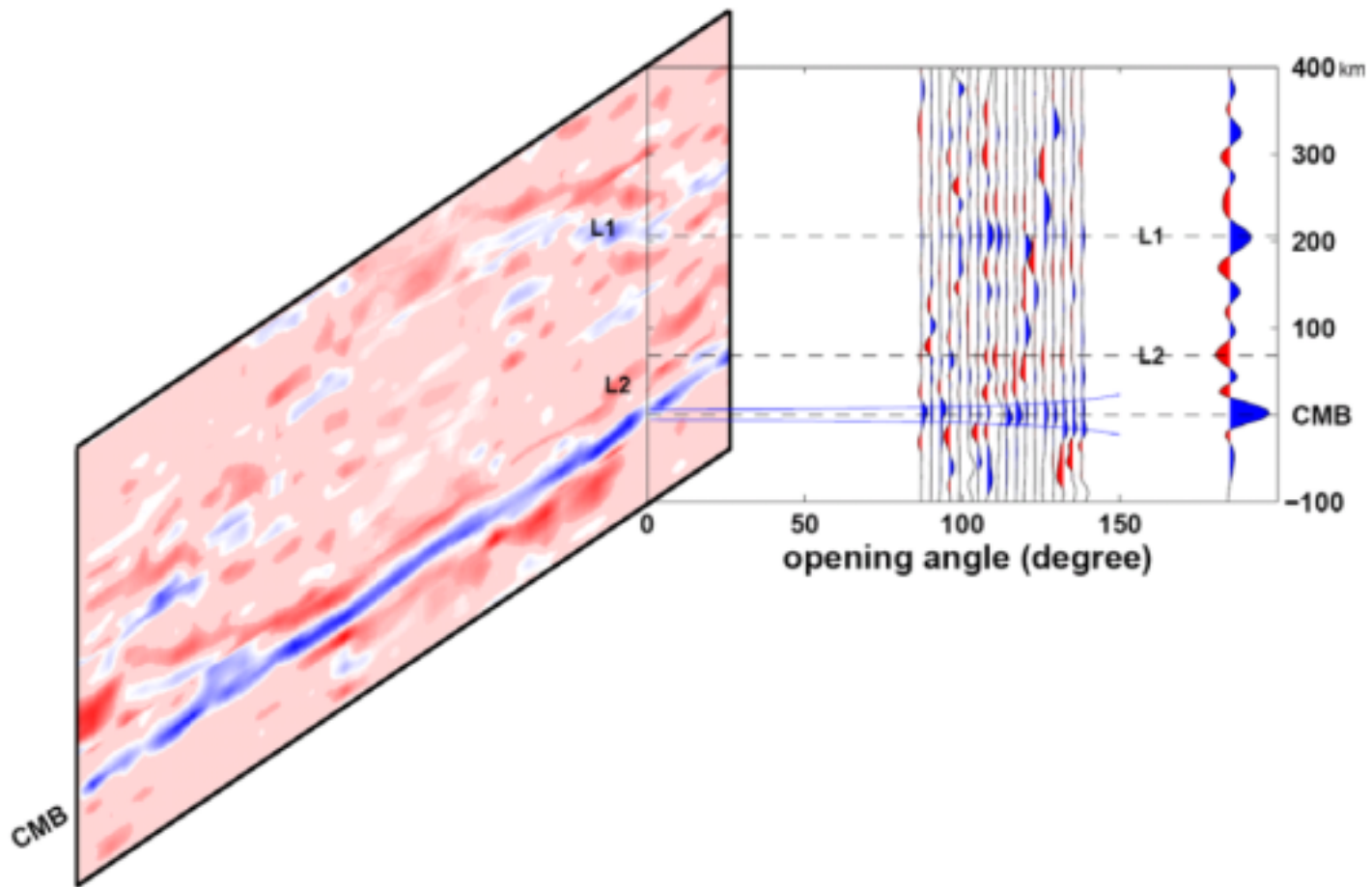


Fig. 3



A

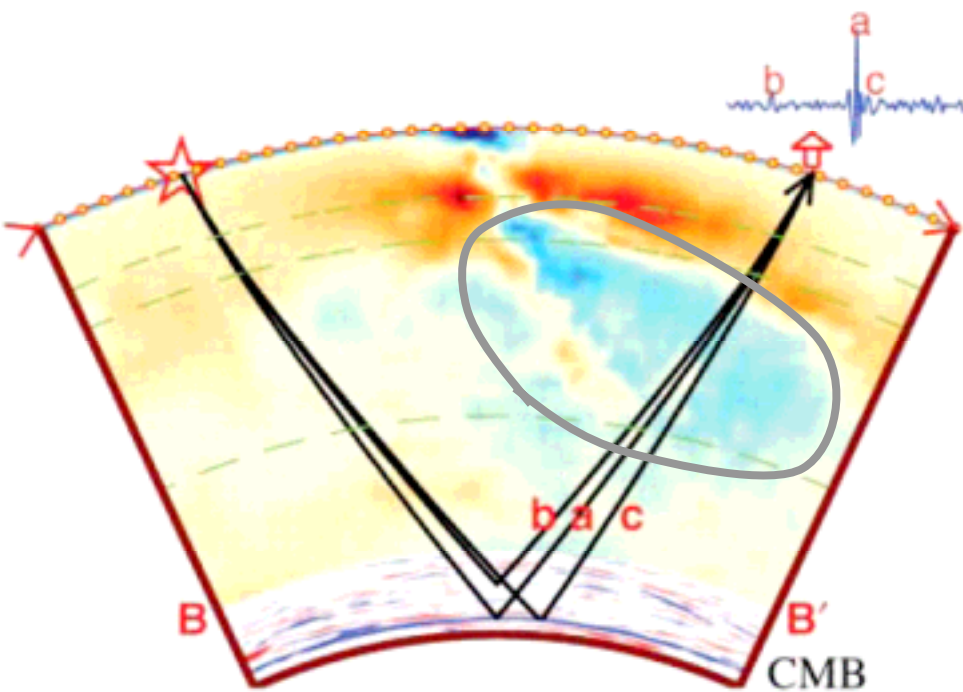
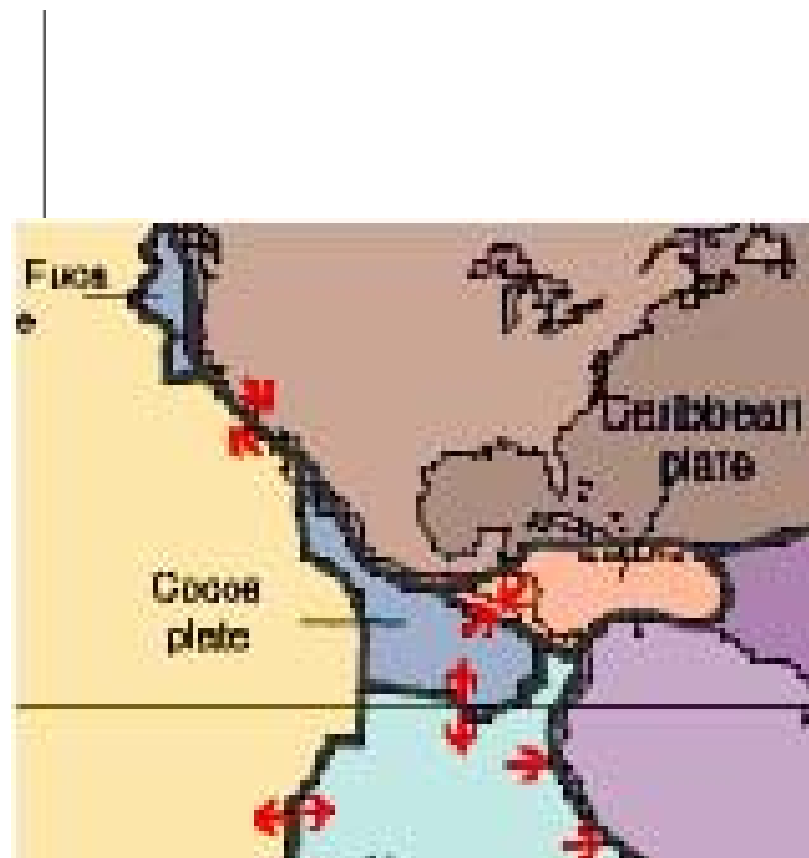
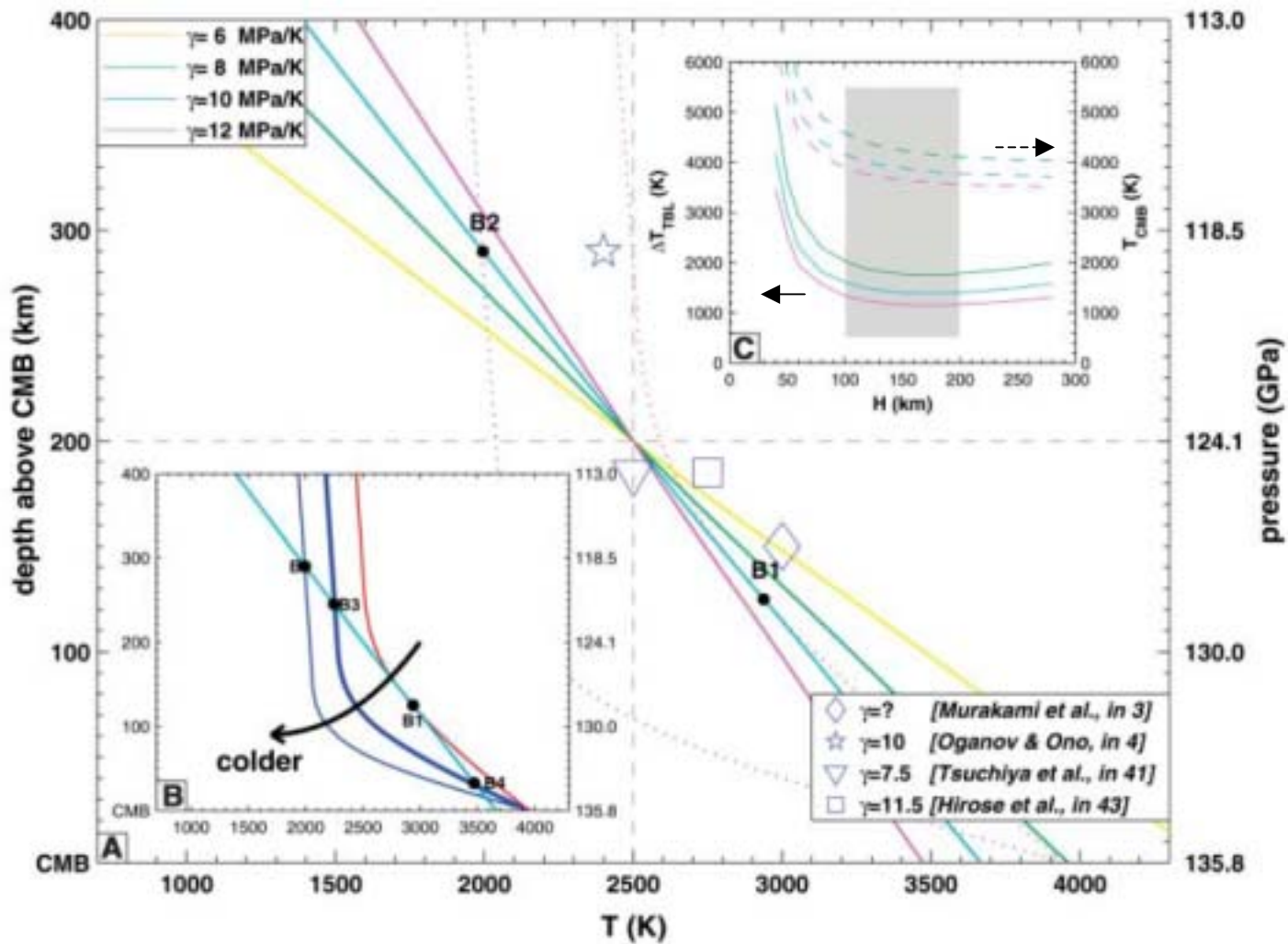


Fig. 1A



from Wikipedia



# Further issue

- More resolved image
- Other region

(to estimate the core heat flux)

Thermal conductivity