Radially Anisotropic Models of Shear Wave Velocity Beneath the Wyoming Craton and Other Places from the USArray Data

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Average Phase Velocities

(a)

Phase velocity (km s\(^{-1}\))

Black lines from the Ak135 model

Love

Rayleigh
Three sub-regions:

Yellowstone hotspot
Rocky Mountains
Great Plains

(b) Rayleigh

Phase velocity (km s$^{-1}$)

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<tr>
<th>Period (s)</th>
<th>YH</th>
<th>GP</th>
<th>RM</th>
<th>AK135</th>
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(c) Love

Phase velocity (km s$^{-1}$)

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1-D $V_{SV}$ and $V_{SH}$

![Graphs showing 1-D shear wave velocity profiles for different regions.](image)

- **(a)**: Average $V_{SV}$ and $V_{SH}$, with AK135 for comparison.
- **(b)**: YH $V_{SV}$, $V_{SH}$, and AK135.
- **(c)**: RM $V_{SV}$, $V_{SH}$, and AK135.
- **(d)**: GP $V_{SV}$, $V_{SH}$, and AK135.

**Depth (km)**
- **Shear wave velocity (km s$^{-1}$)**

**Legend:**
- Blue: Average $V_{SV}$
- Red: Average $V_{SH}$
- Black: AK135
- Red: Specific region's $V_{SH}$
- Blue: Specific region's $V_{SV}$
3-D Vsv model

(Dave and Li, Geology, 2016)
3-D Vsv model

3-D Vsh model
Voigt average Vs

Radial anisotropy

Voigt Average Vs (km/s)

Radial Anisotropy (%)
**Vs**

High velocity anomaly associated with $V_{sv}>V_{sh}$, mantle downwelling

Low velocities associated with $V_{sh}>V_{sv}$, dominant shear deformation (weaker upwelling)

(Dave and Li, in prep)
Evolution of the Wyoming Craton

- Weakening by hydration
- Erosion by mantle upwelling
- Modification by small-scale convection
- Erosion by plume re-enforced convection
Plume-Craton Interaction

(Weeraratne et al., 2003)
Shear wave splitting measurements

Radial anisotropy

(Liu et al., 2014)
Summary for the Wyoming craton

• The Wyoming cratonic lithosphere was weakened by hydration from the Farallon slab, and partially eroded by mantle upwelling and small-scale convection.
• Hot plume materials project into the craton through weak channels at the base of the lithosphere, and upwelling is likely developing at the eastern boundary of the craton.
• Radial anisotropy provides additional constraints for the crustal and mantle structure.
NW Gulf of Mexico Coast
3-D shear wave velocity and radial anisotropy models under Texas

Vsv

Radial anisotropy

High velocity beneath the Ouachita belt

Large +anisotropy (Vsh>Vsv) in the coastal plain

Alternative high and low velocity anomalies in the asthenosphere

Complex relation between velocity and anisotropy

(Yao and Li, GRL, 2016)

(Yao and Li, in prep)
Station distribution
Rayleigh and Love wave phase velocities in Alaska

(Pepin and Li, in prep)
The Legacy of EarthScope

... 

Develop anisotropic velocity models

Get into the details
THANK YOU

QUESTIONS?