

# Model Update March 2011: Upper Mantle Heterogeneity beneath North America from Traveltime Tomography with Global and USArray Transportable Array Data

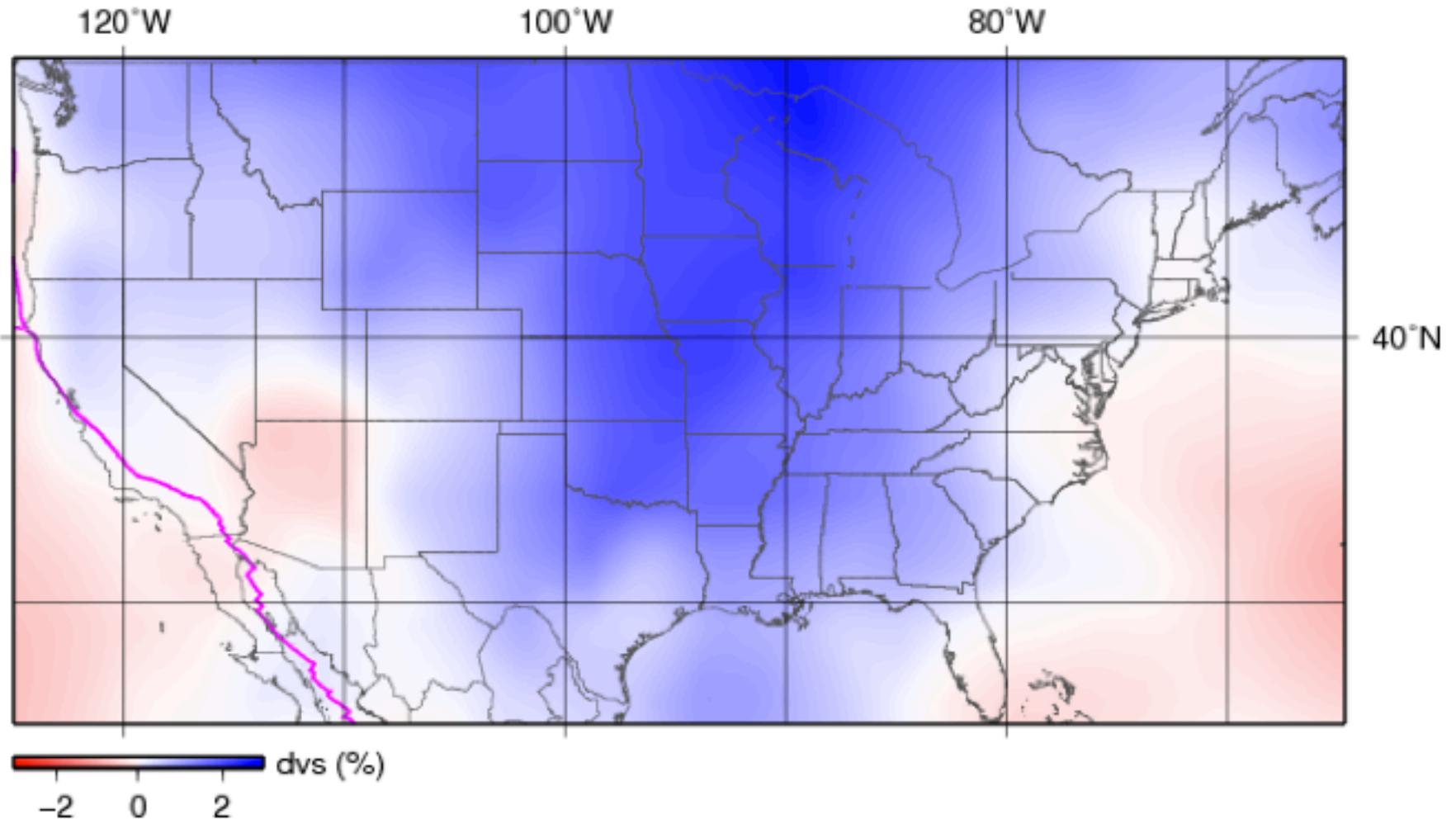
Burdick, van der Hilst, Vernon, Martynov, Cox, Eakins, Karasu,  
Tylell, Astiz, and Pavlis

SRL January 2012

And a comparison with similar USArray based models and tools for visualizing in a  
common medium

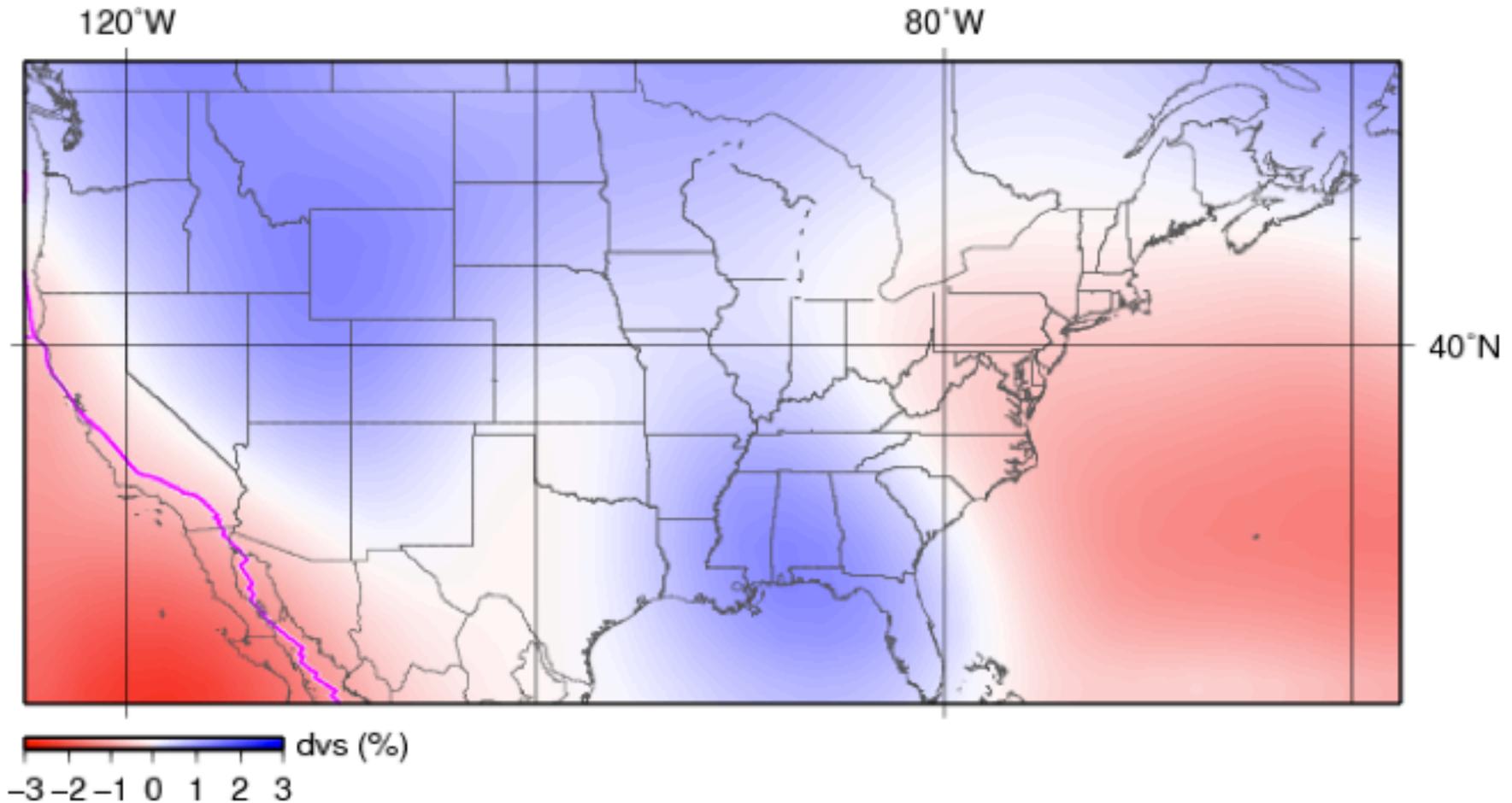
# USA on a global scale

United States, GyPSuM dvS, Depth 300 km



# USA on a global scale

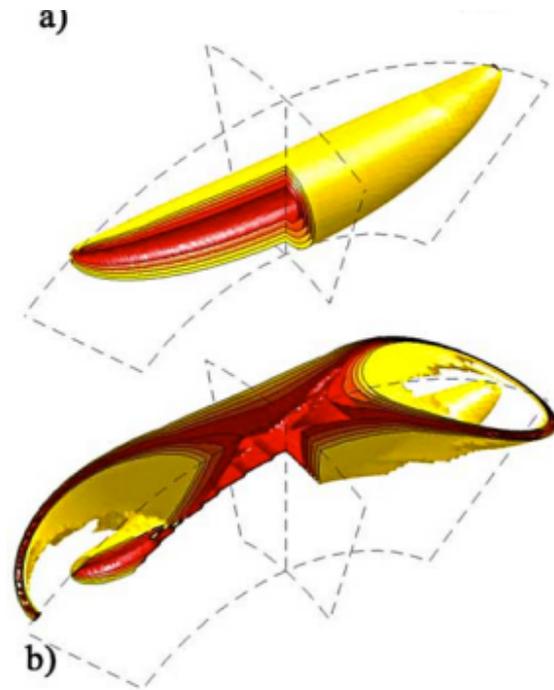
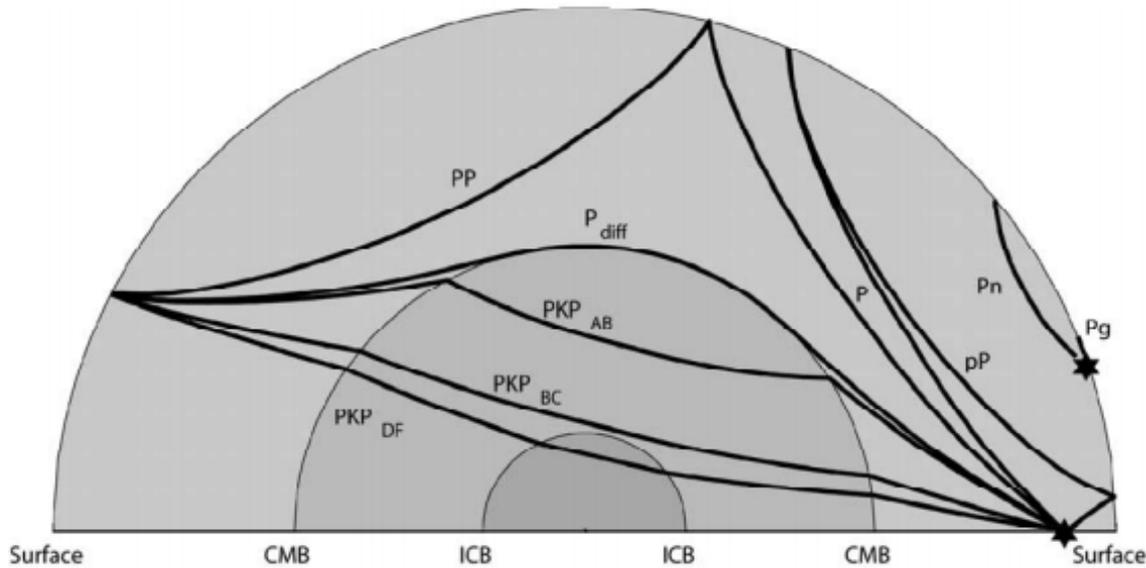
United States, SAW642ANb dvS, Depth 300 km



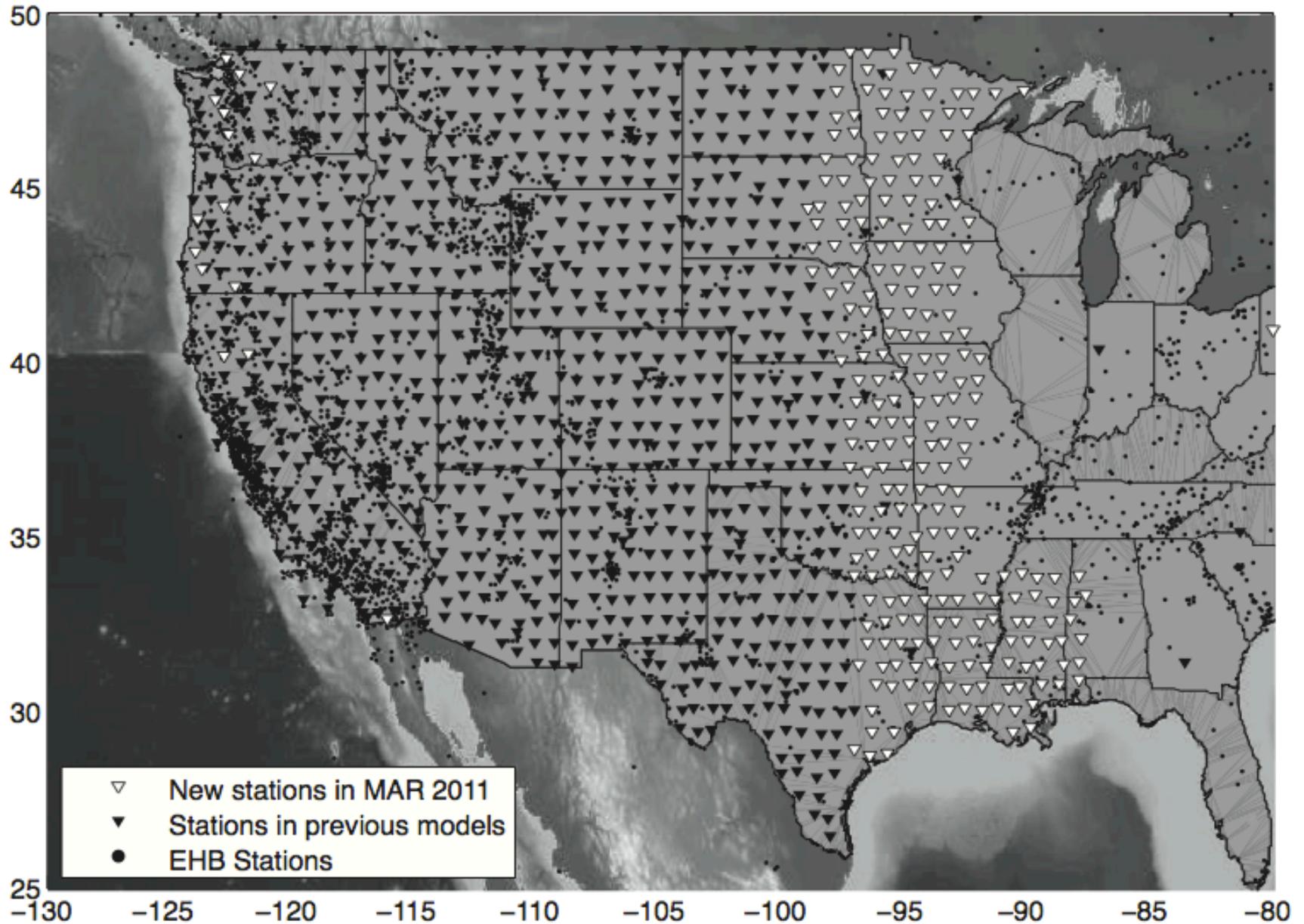
# Model setup

- P traveltimes residuals
  - Includes P, pP, Pn, PP-P, and PKP (and likely other branches of P)
  - Delay times from:
    - International Seismological Centre (ISC)
    - National Earthquake Information Center (NEIC)
    - Array Network Facility (ANF)
- USArray focused, but delays are global
  - 10 Million total residuals. ~1.6M are USArray
  - Reduces uncertainty due to out-of-model structure
- Grid is adaptive to data coverage
  - Minimum of  $0.3^\circ \times 0.3^\circ \times 45\text{km}$

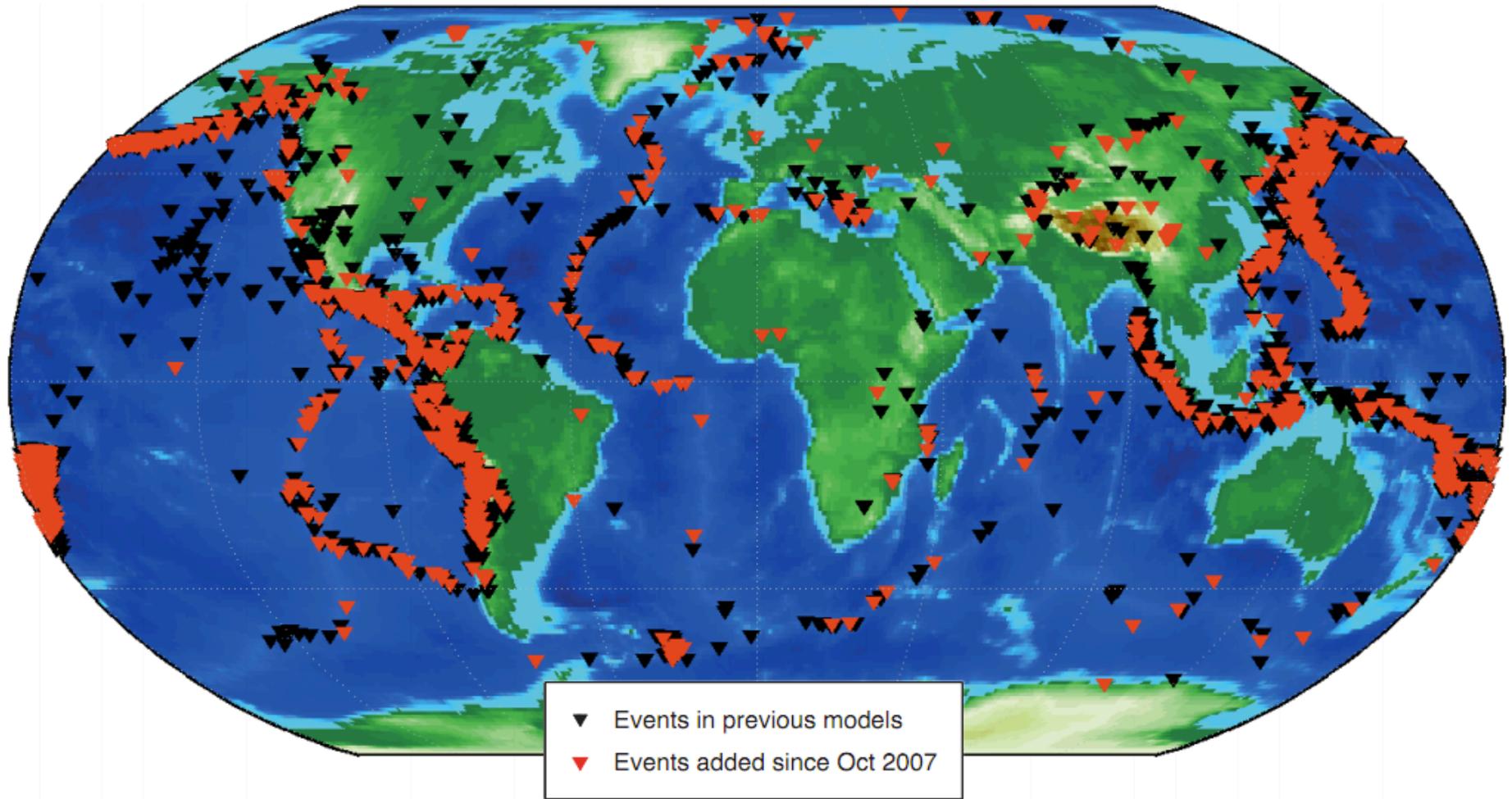
# Phases used in Li et al, 2007



# US Station Coverage



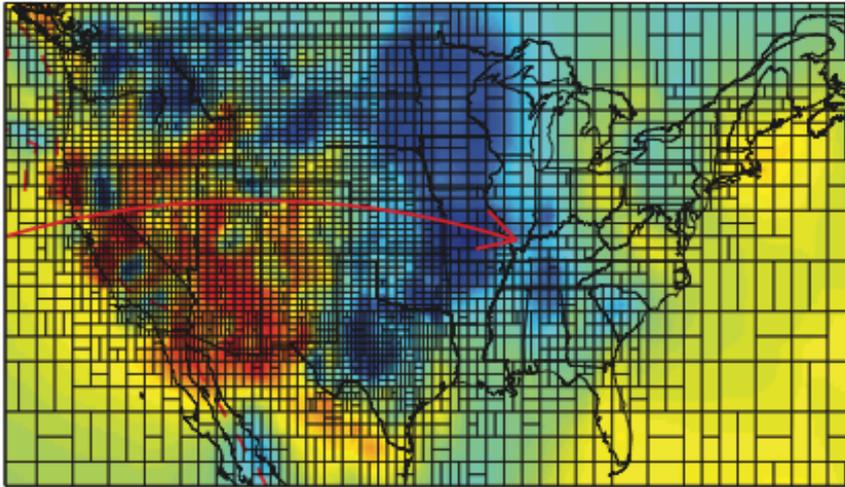
# Previous Event List



# Mesh comparison

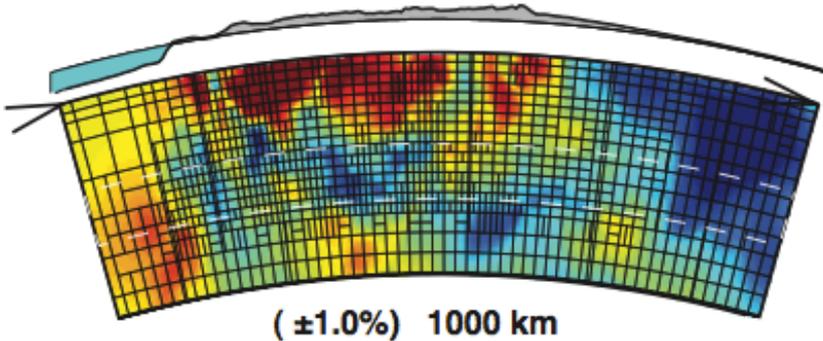
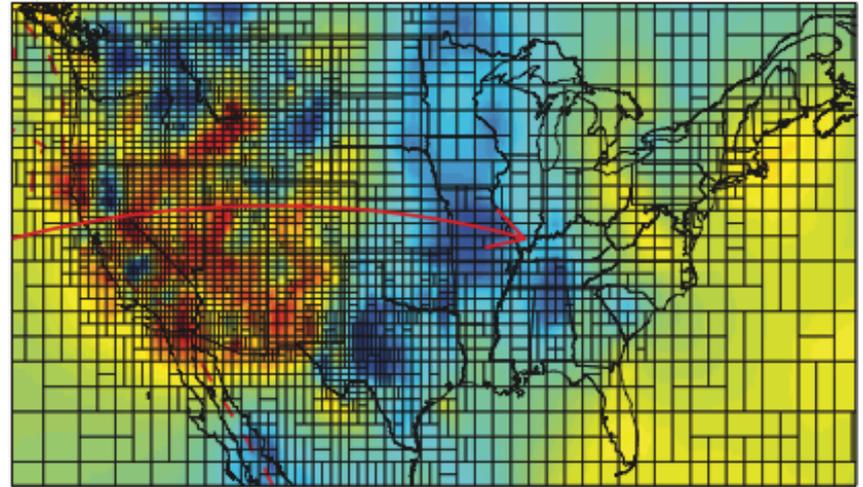
MAR 2011 - Depth 200 km

$\pm 1.40\%$

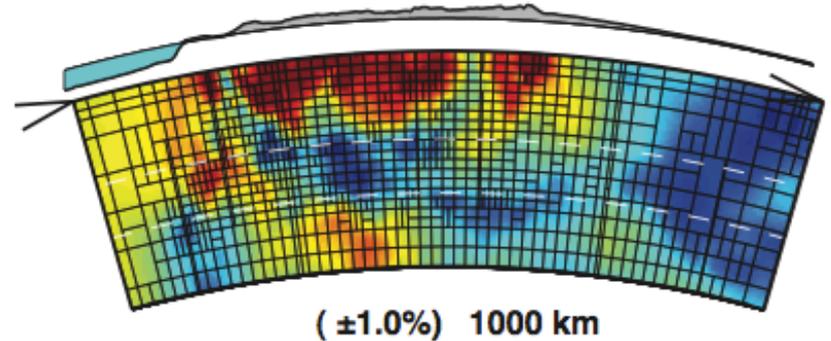


JAN 2010 - Depth 200 km

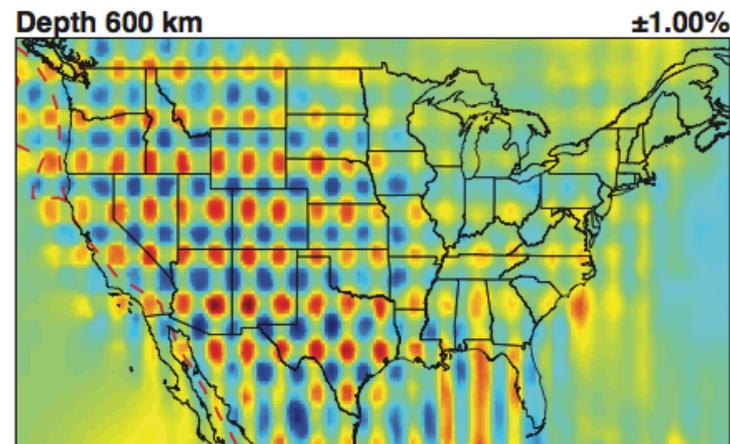
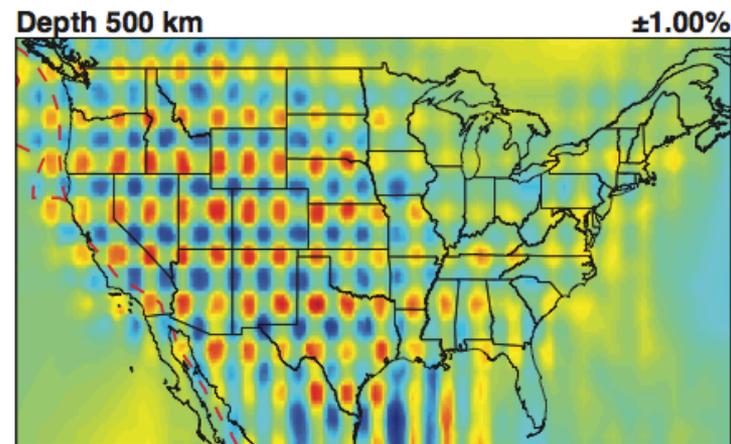
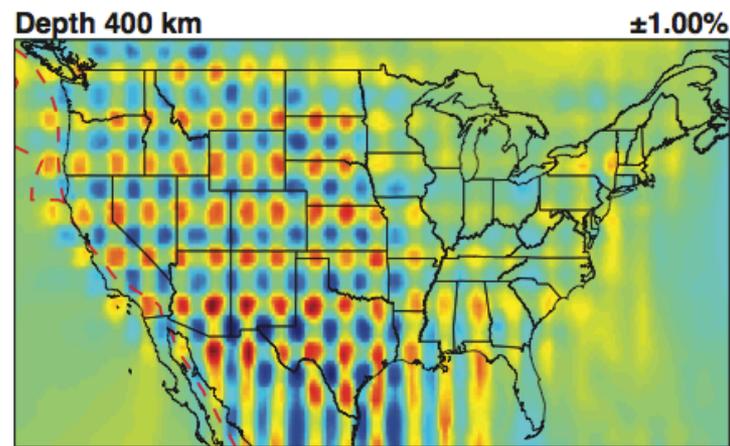
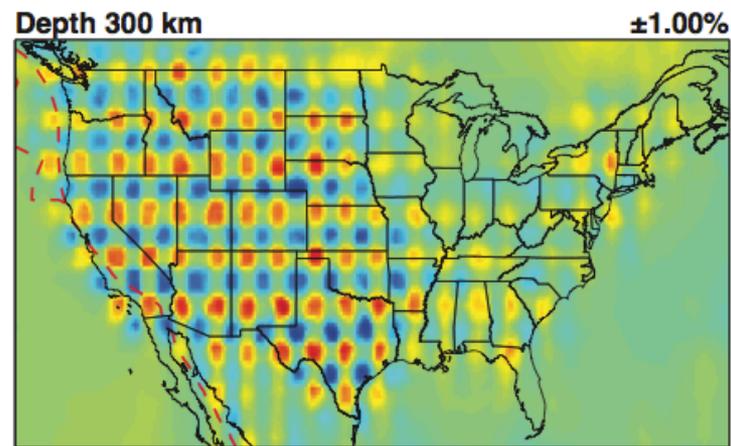
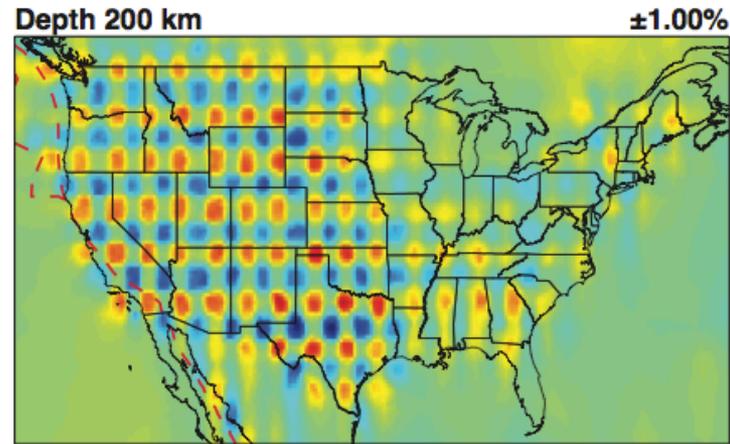
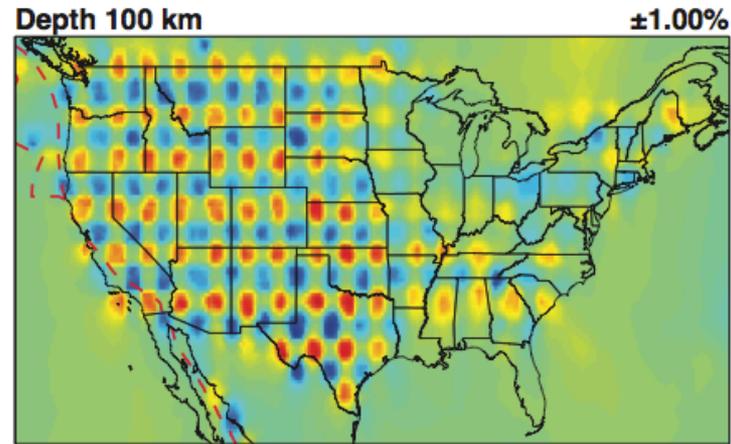
$\pm 1.40\%$



( $\pm 1.0\%$ ) 1000 km

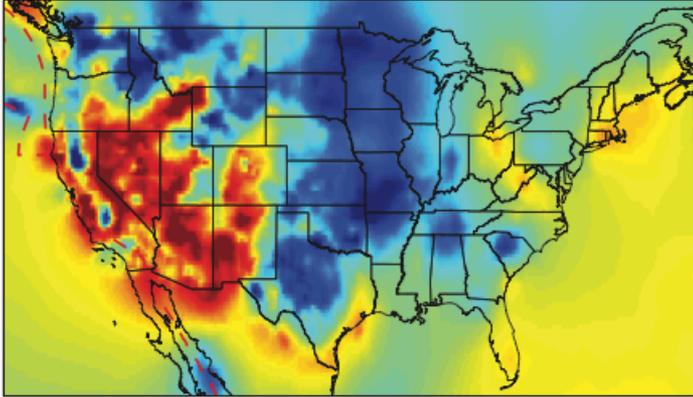


( $\pm 1.0\%$ ) 1000 km



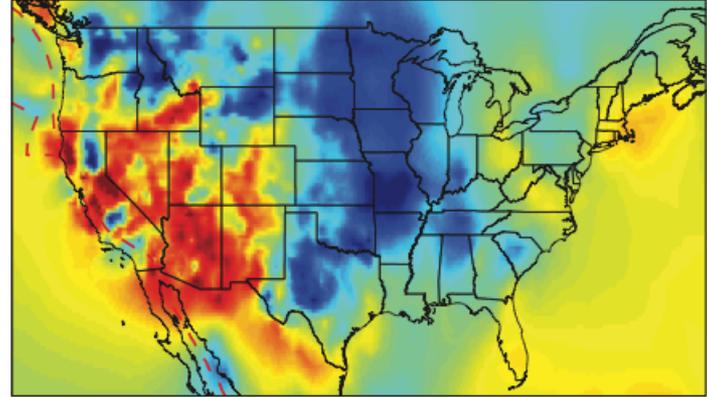
Depth 100 km

$\pm 1.20\%$



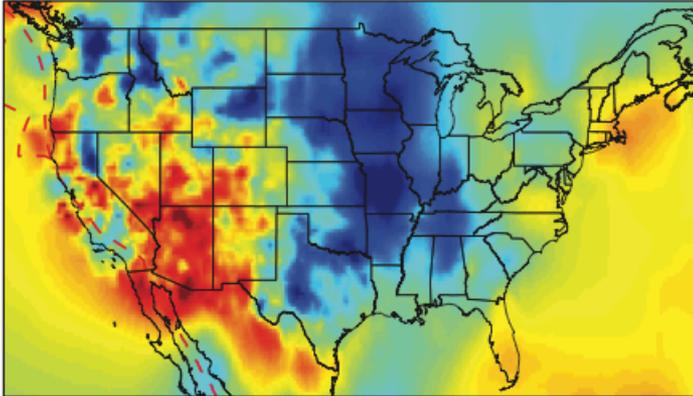
Depth 200 km

$\pm 1.20\%$



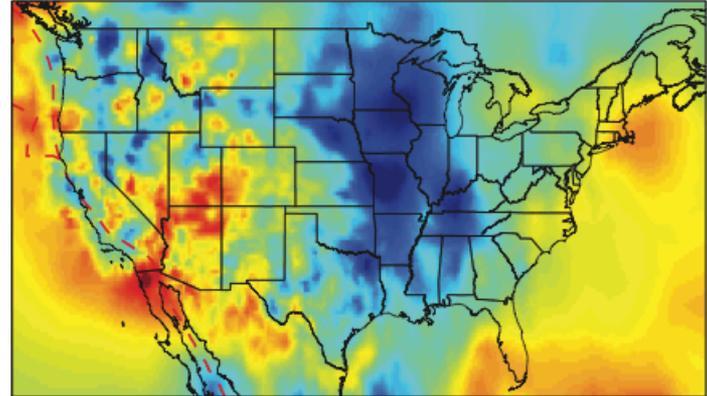
Depth 300 km

$\pm 1.00\%$



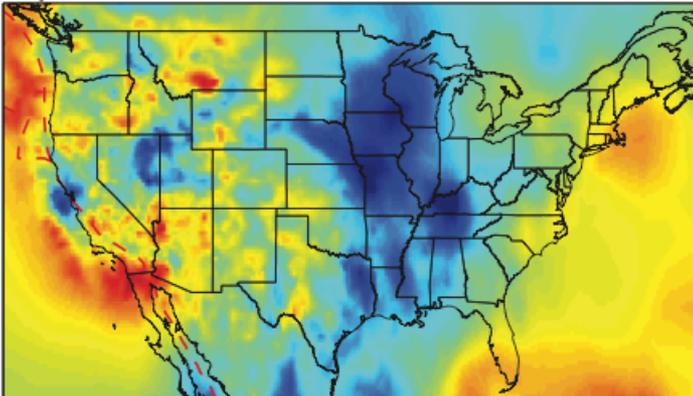
Depth 400 km

$\pm 1.00\%$



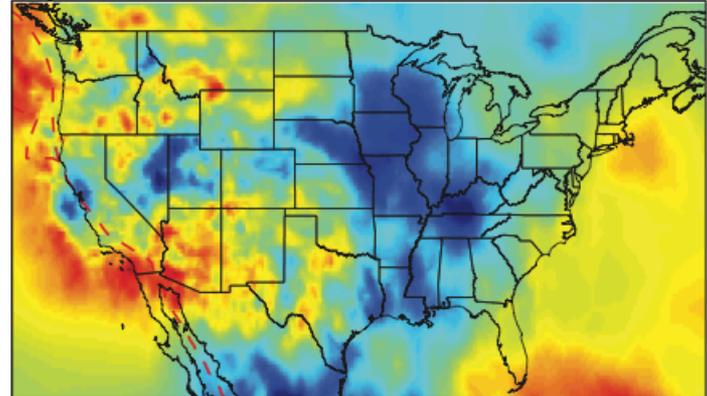
Depth 500 km

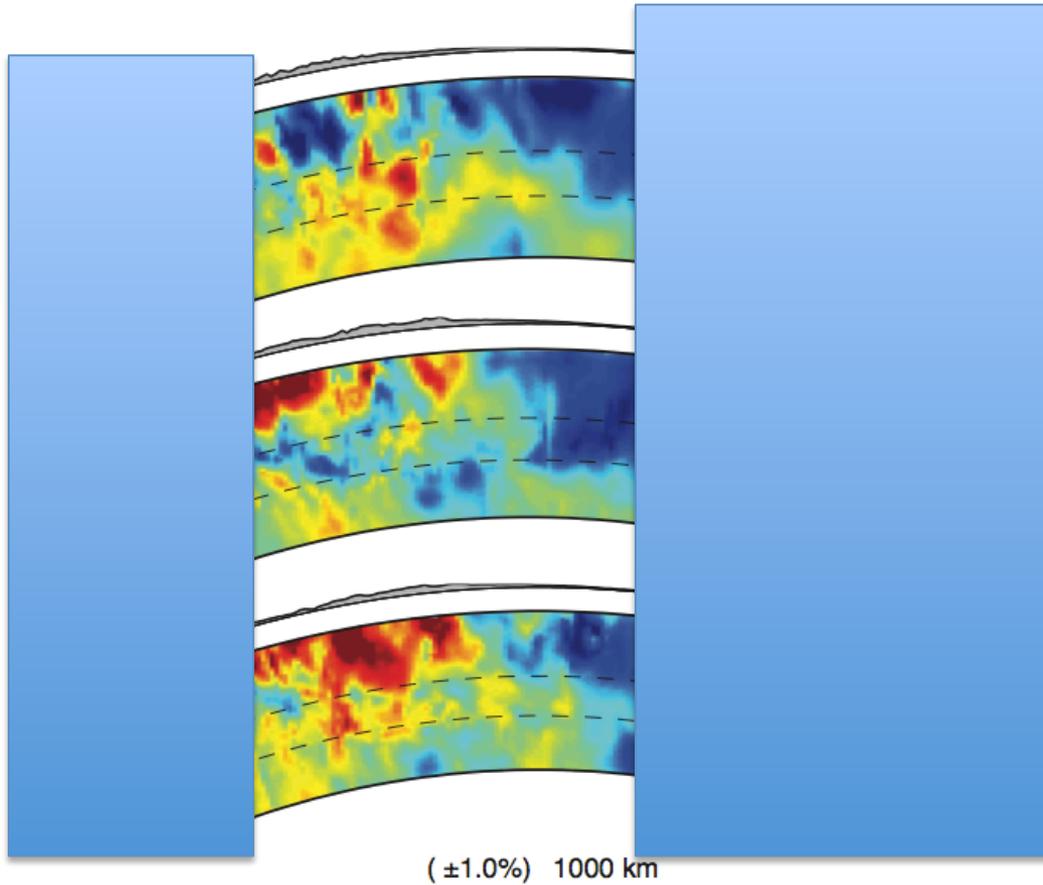
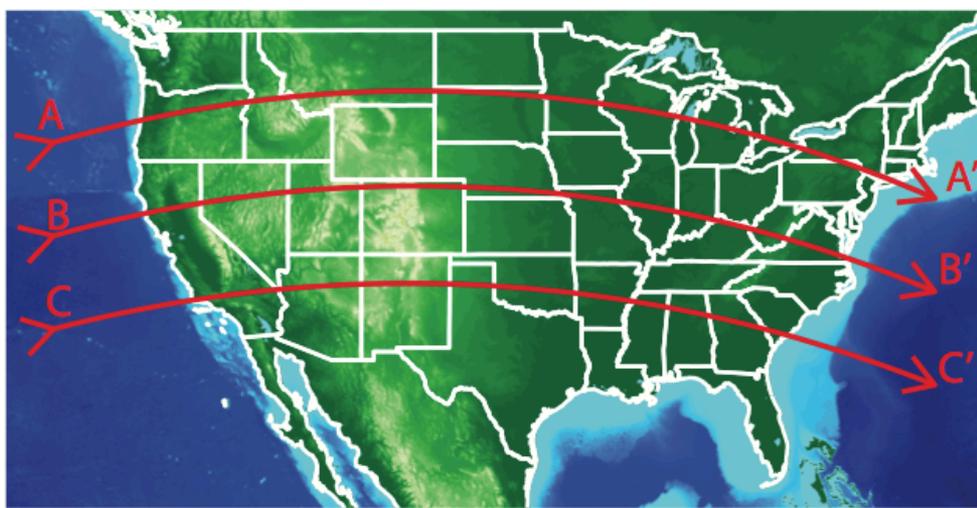
$\pm 1.00\%$



Depth 600 km

$\pm 1.00\%$

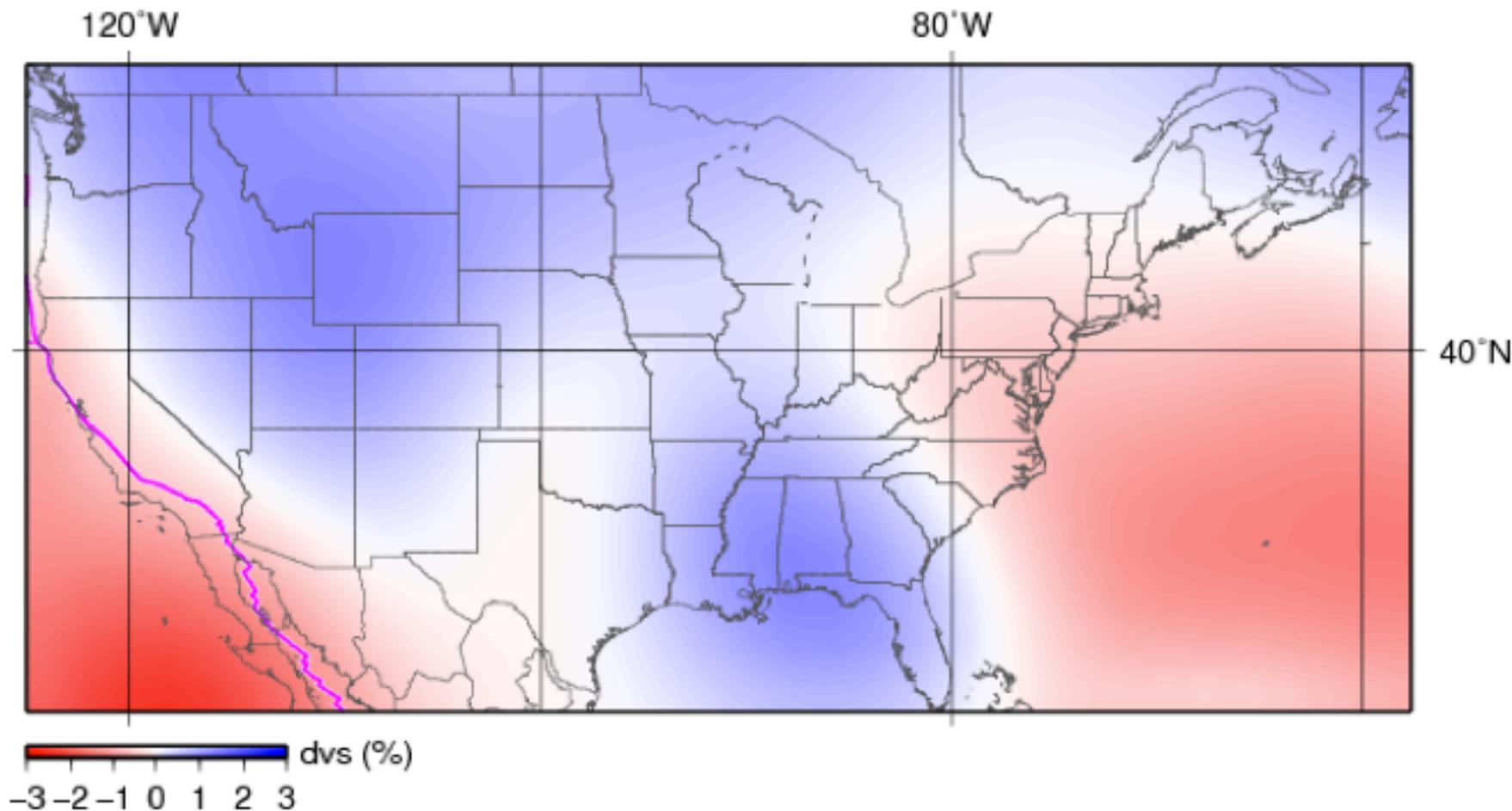




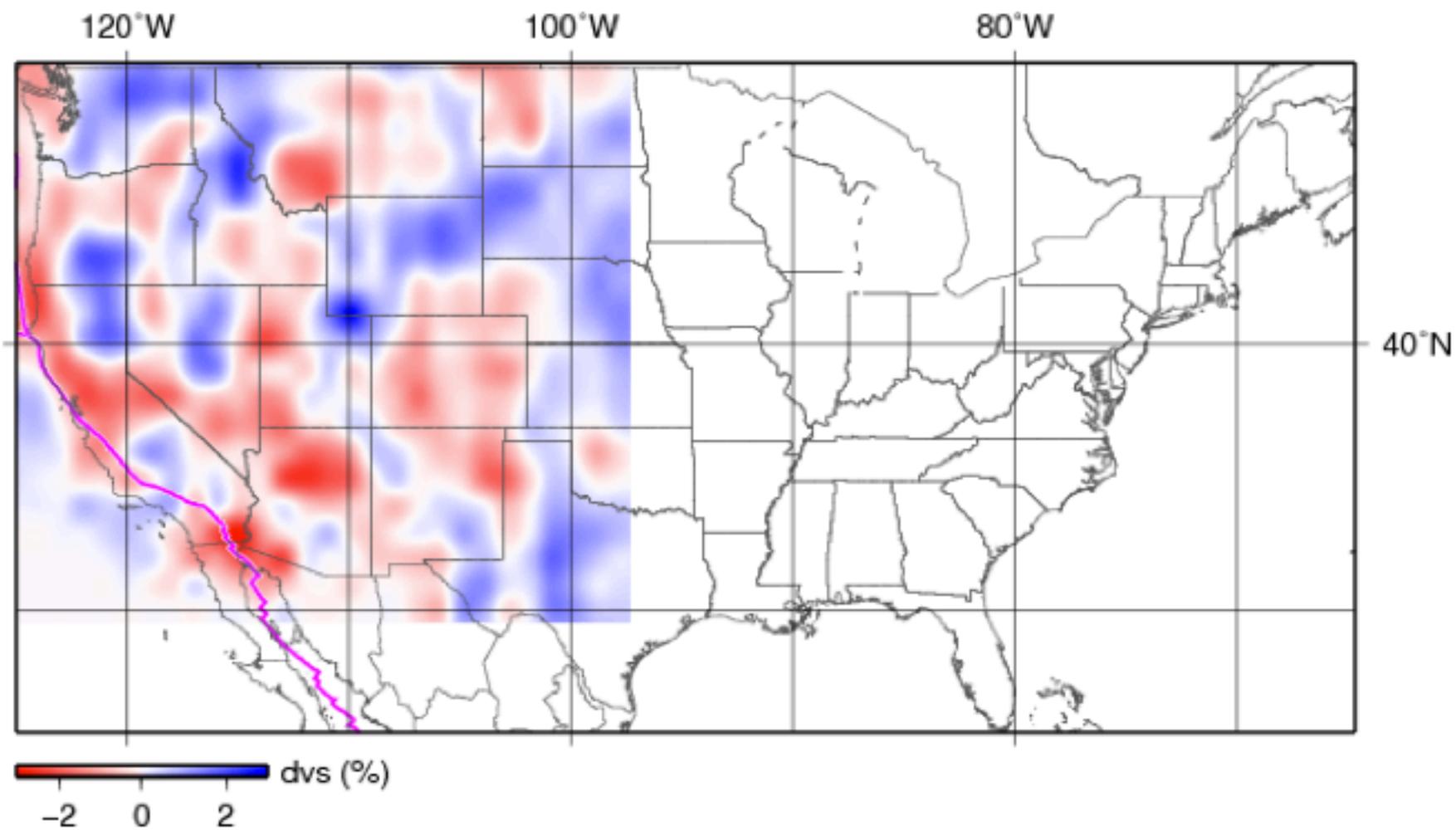
# Tomographic Model Comparison

- <http://www.iris.edu/dms/products/emc/>

# United States, SAW642ANb dvS, Depth 300 km

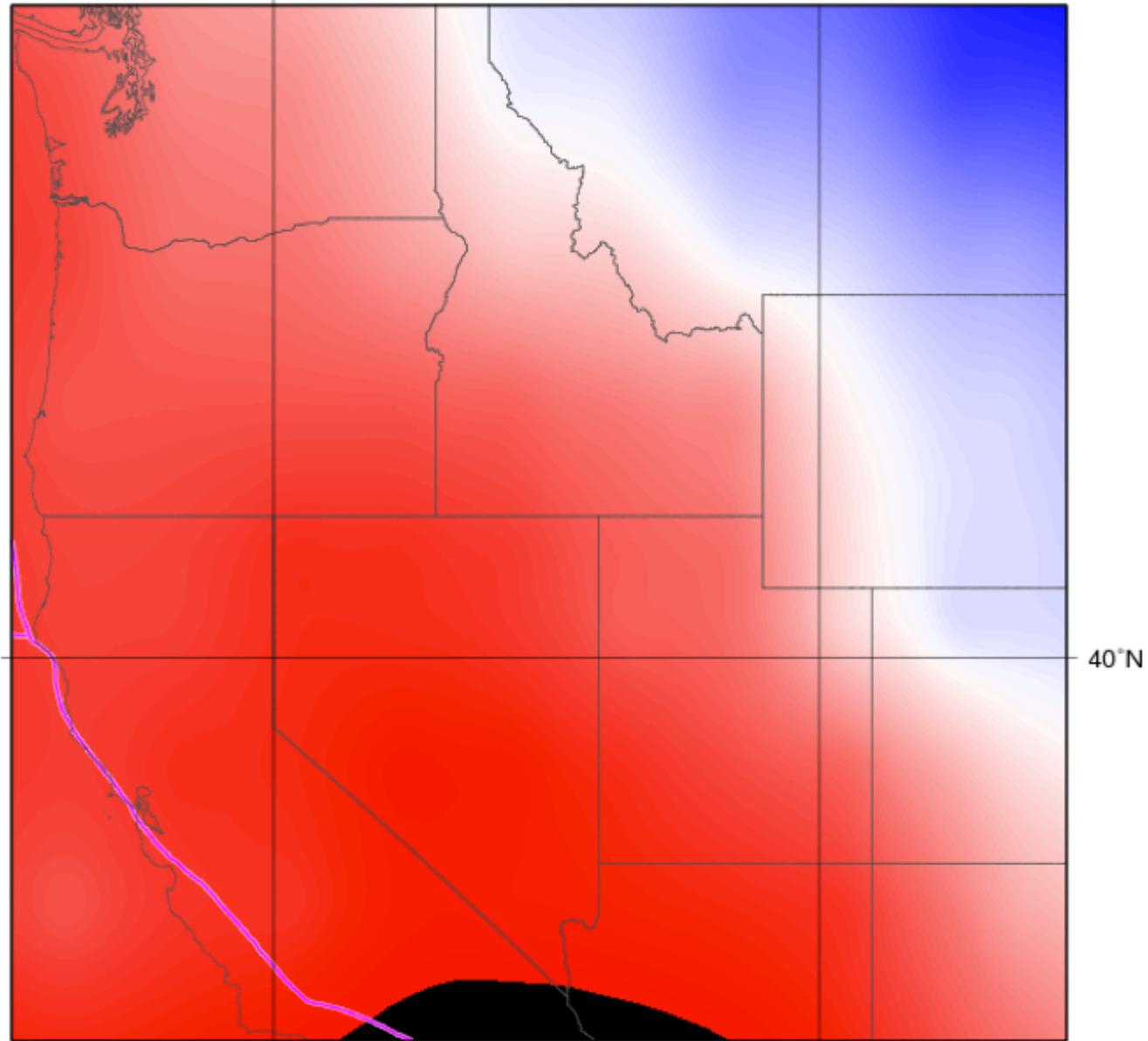


# United States, DNA10 dvS, Depth 300 km

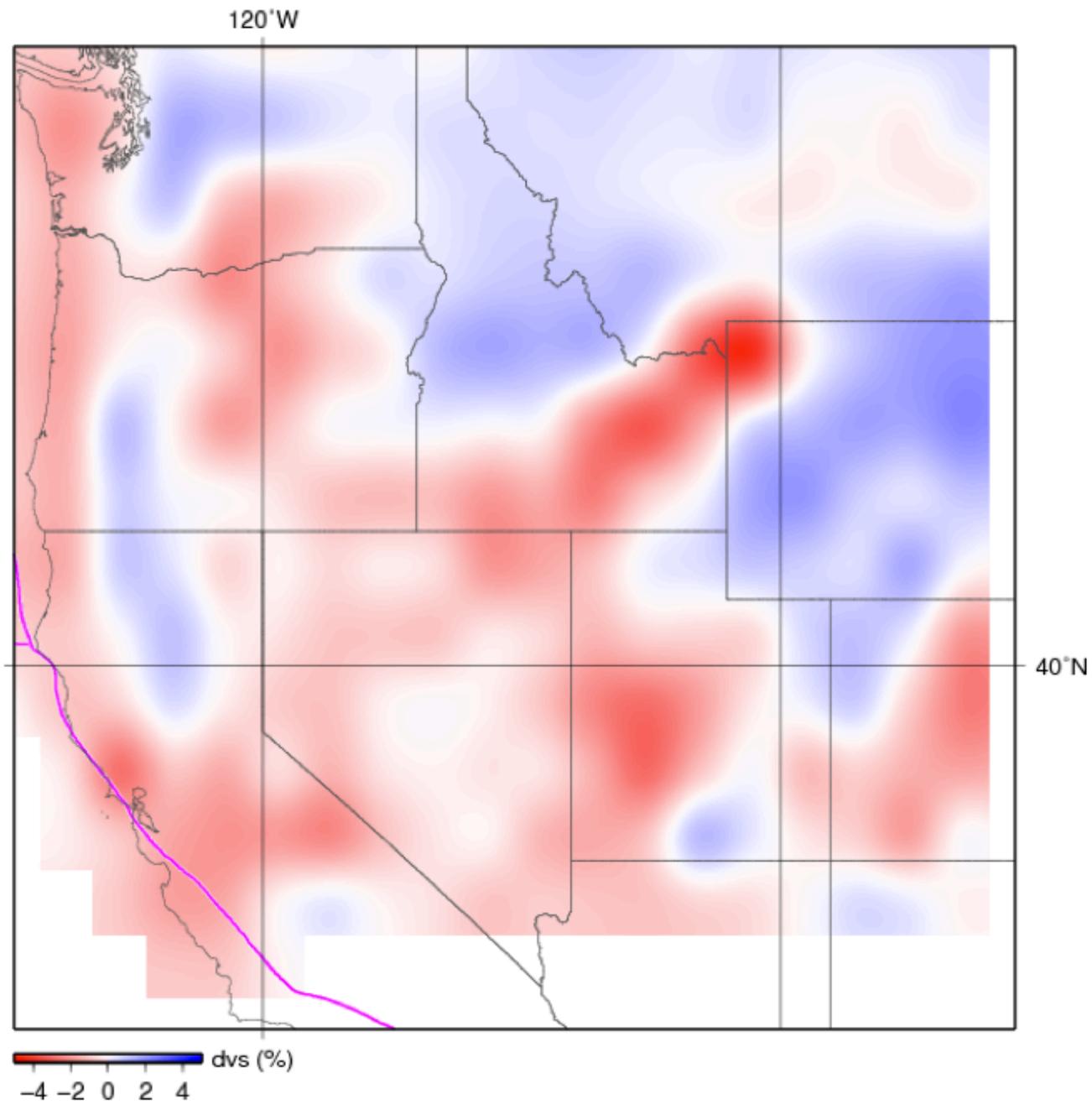


# United States, TX2011 dvS, Depth 100 km

120°W

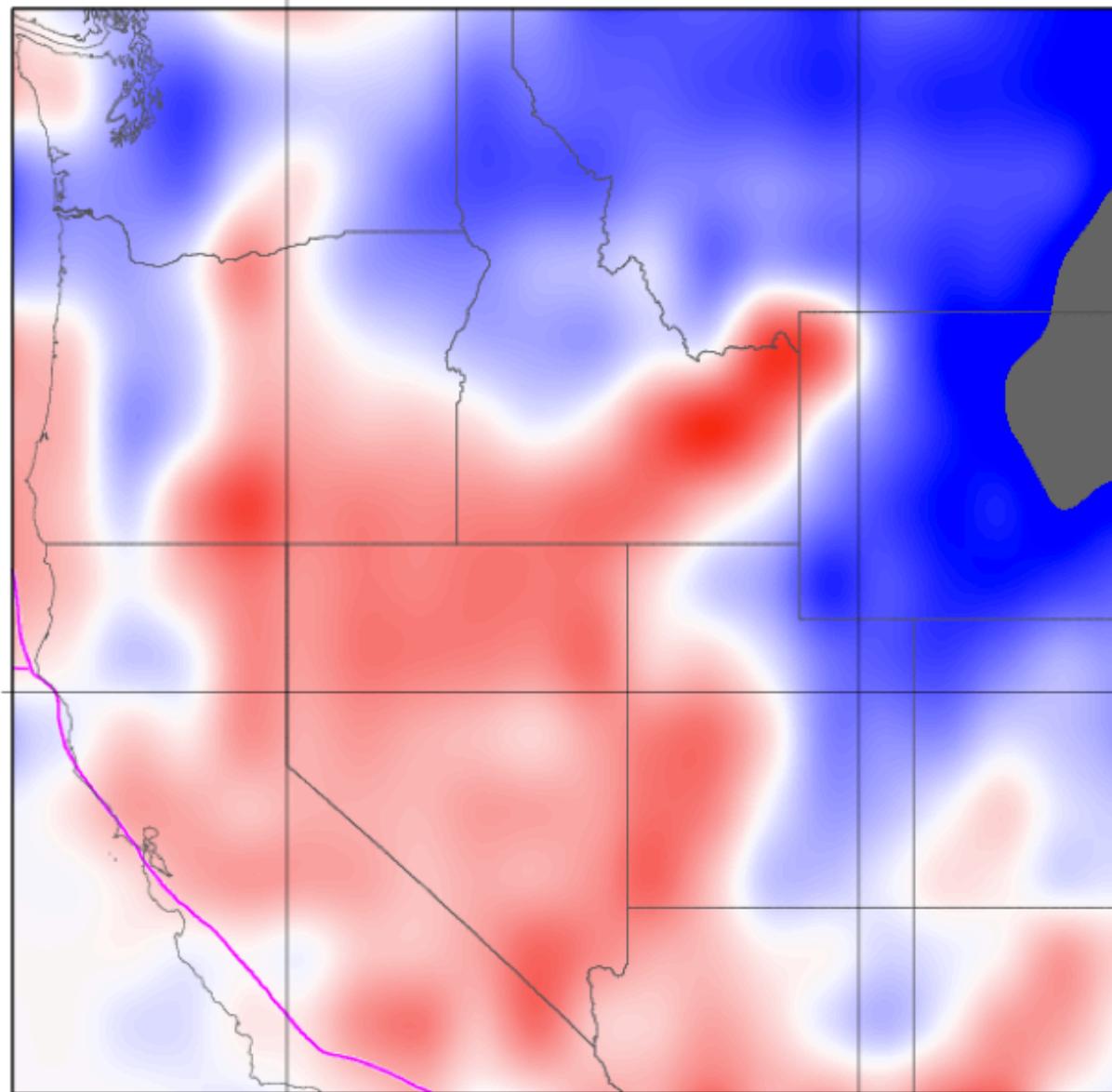


# United States, NWUS11 dvS, Depth 100 km



# United States, DNA10 dvS, Depth 100 km

120°W

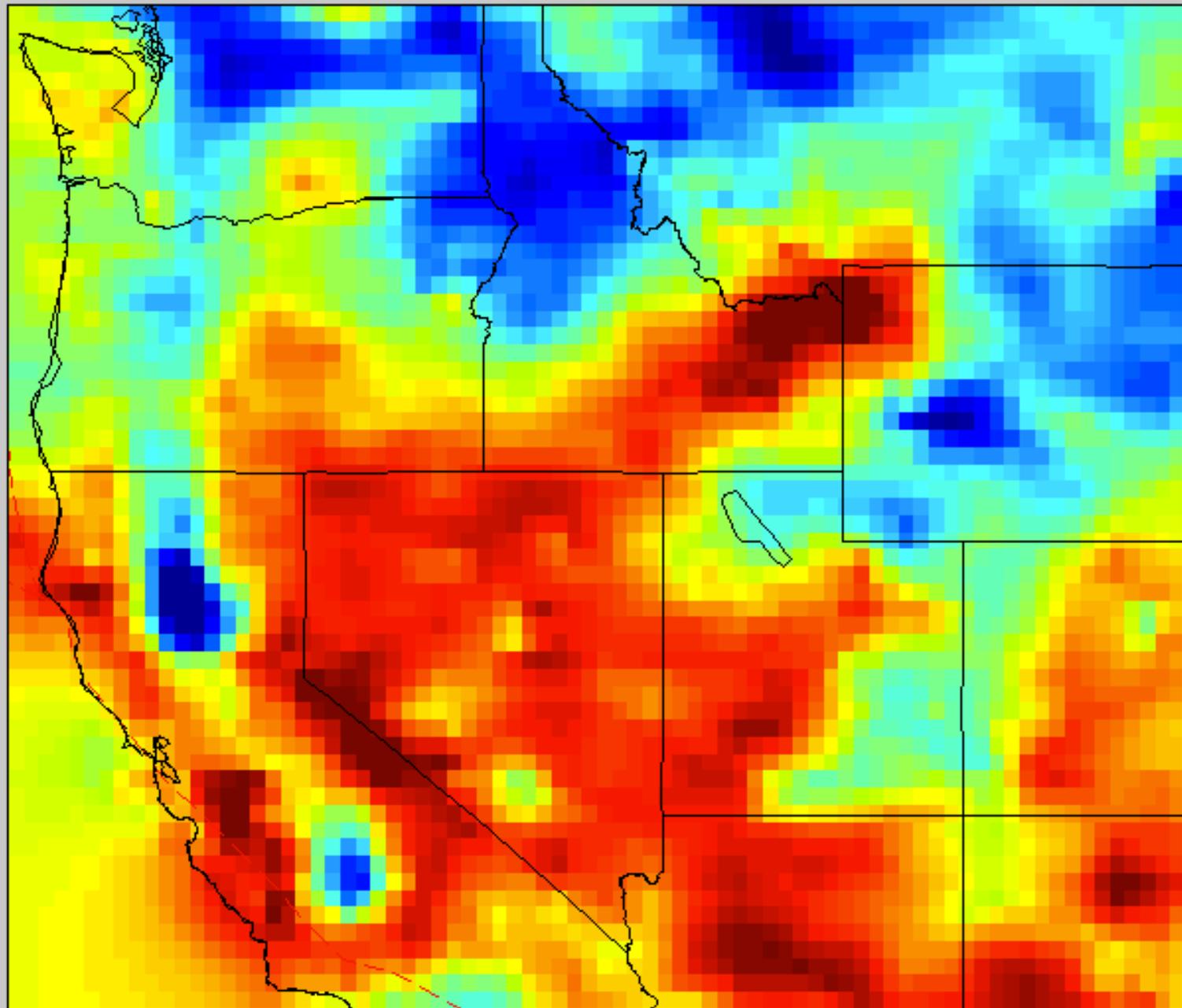


40°N

-4 -2 0 2 4 dvS (%)

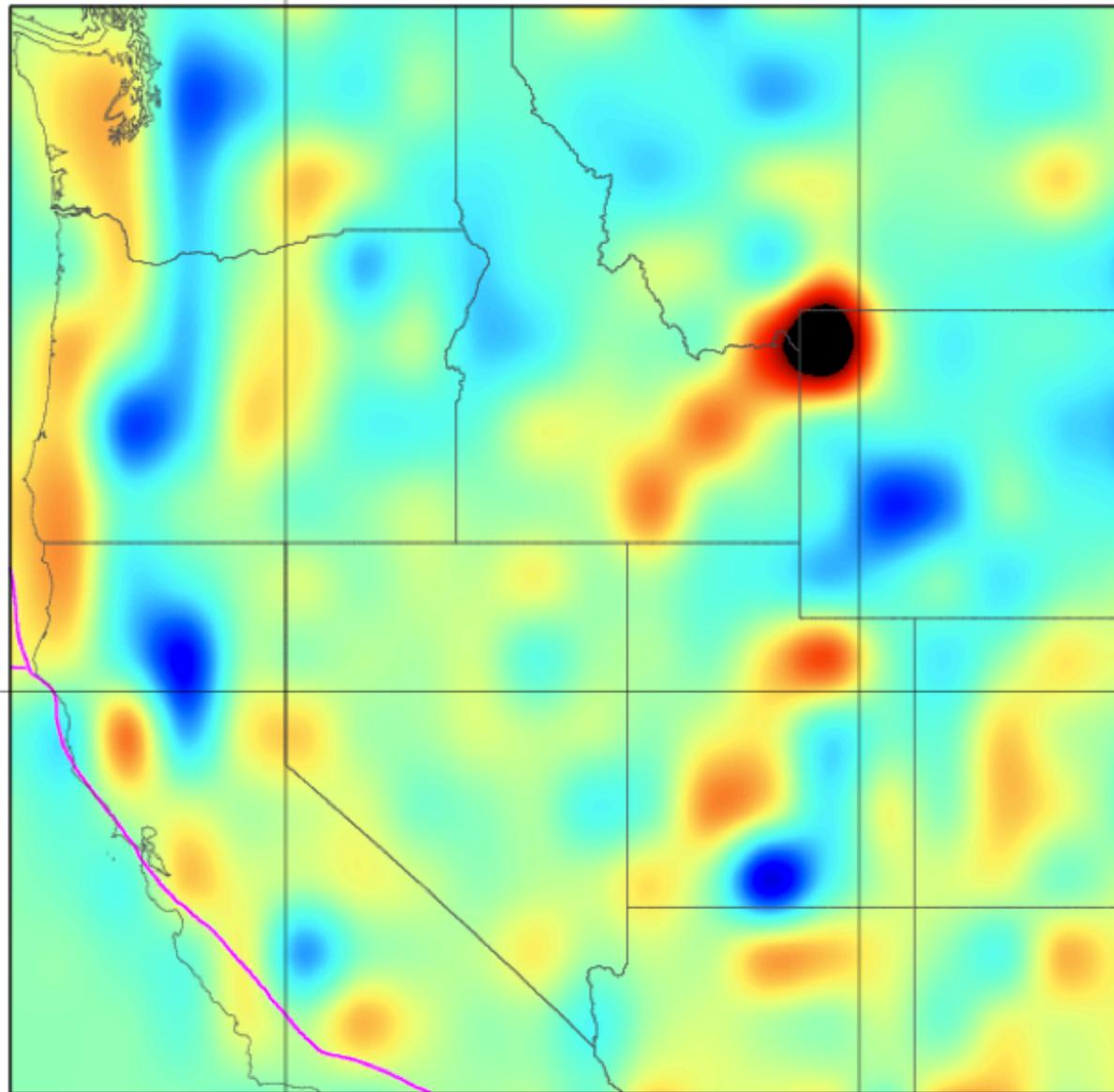
Depth 100 km

$\pm 1.50\%$



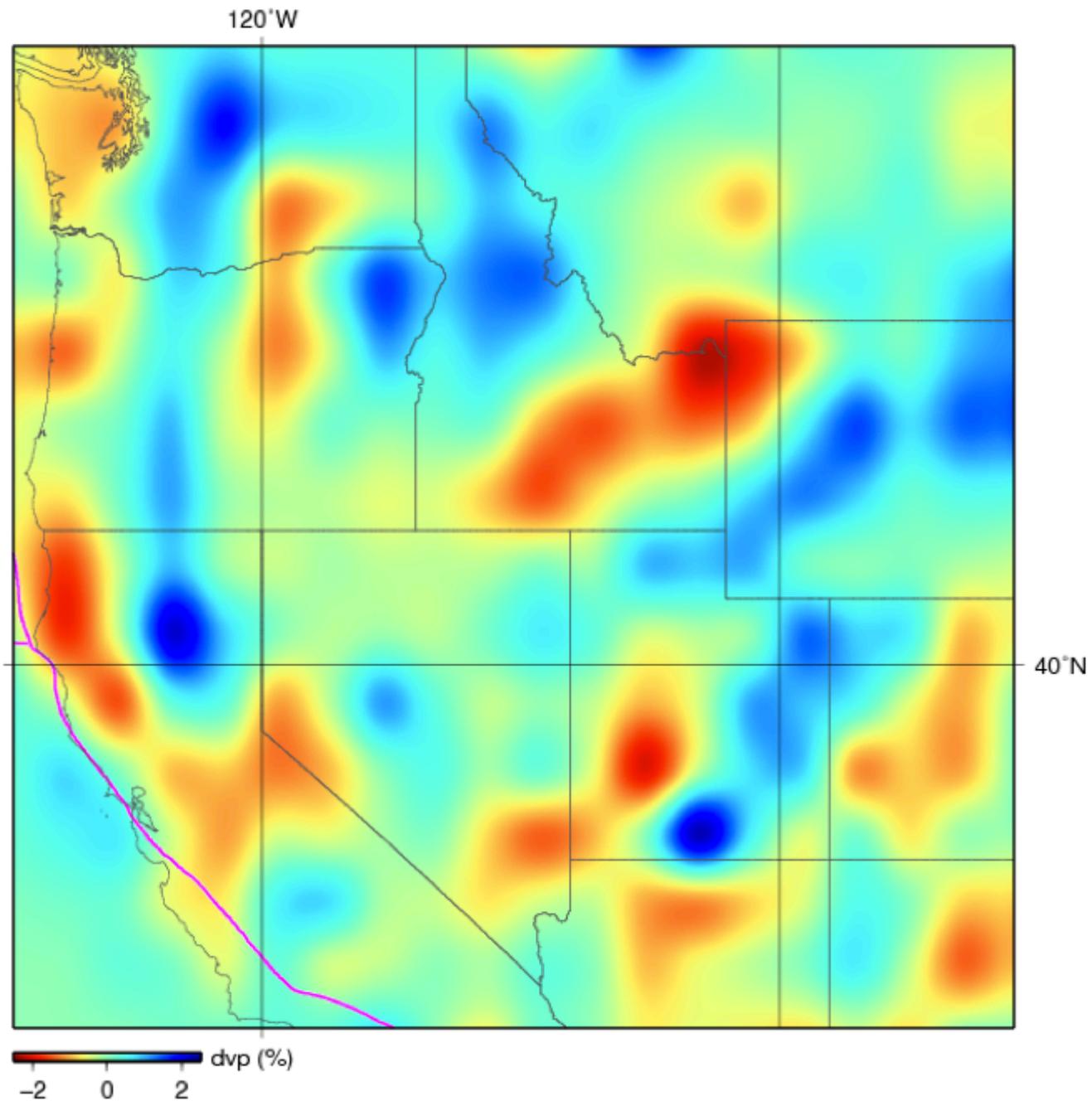
# United States, DNA09 dvP, Depth 100 km

120°W



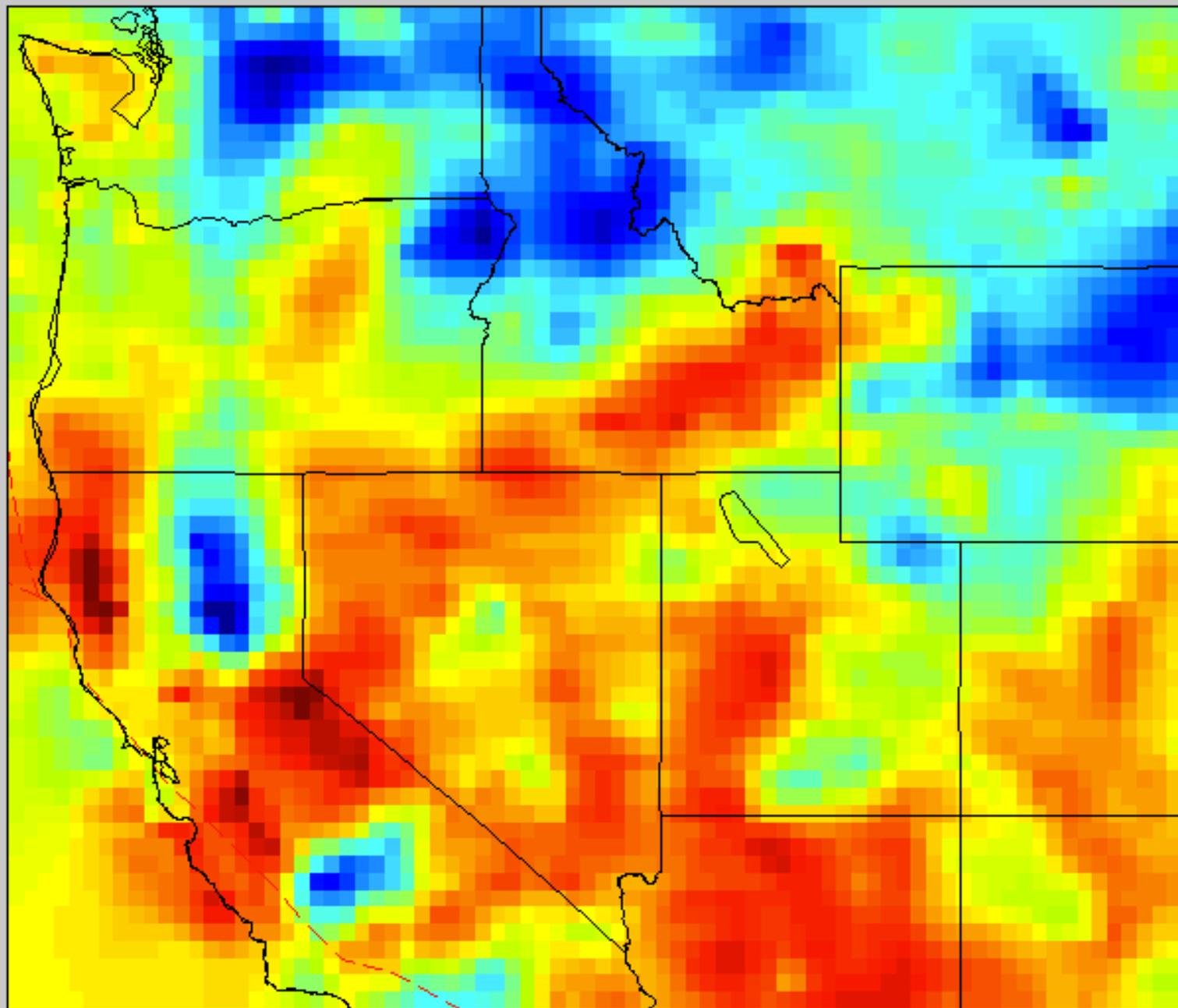
-2 0 2 dvP (%)

# United States, DNA09 dvP, Depth 200 km



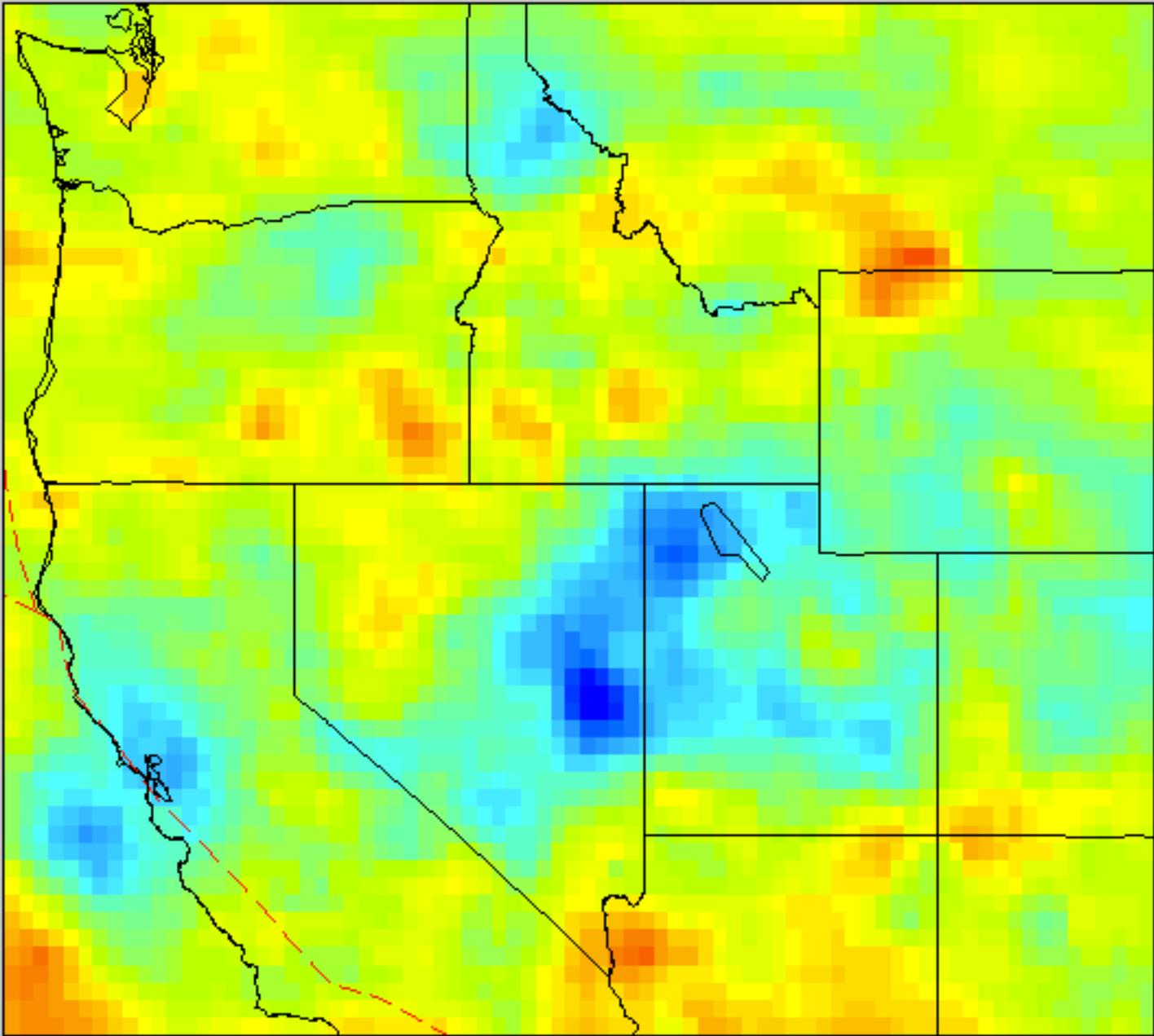
Depth 200 km

$\pm 1.50\%$

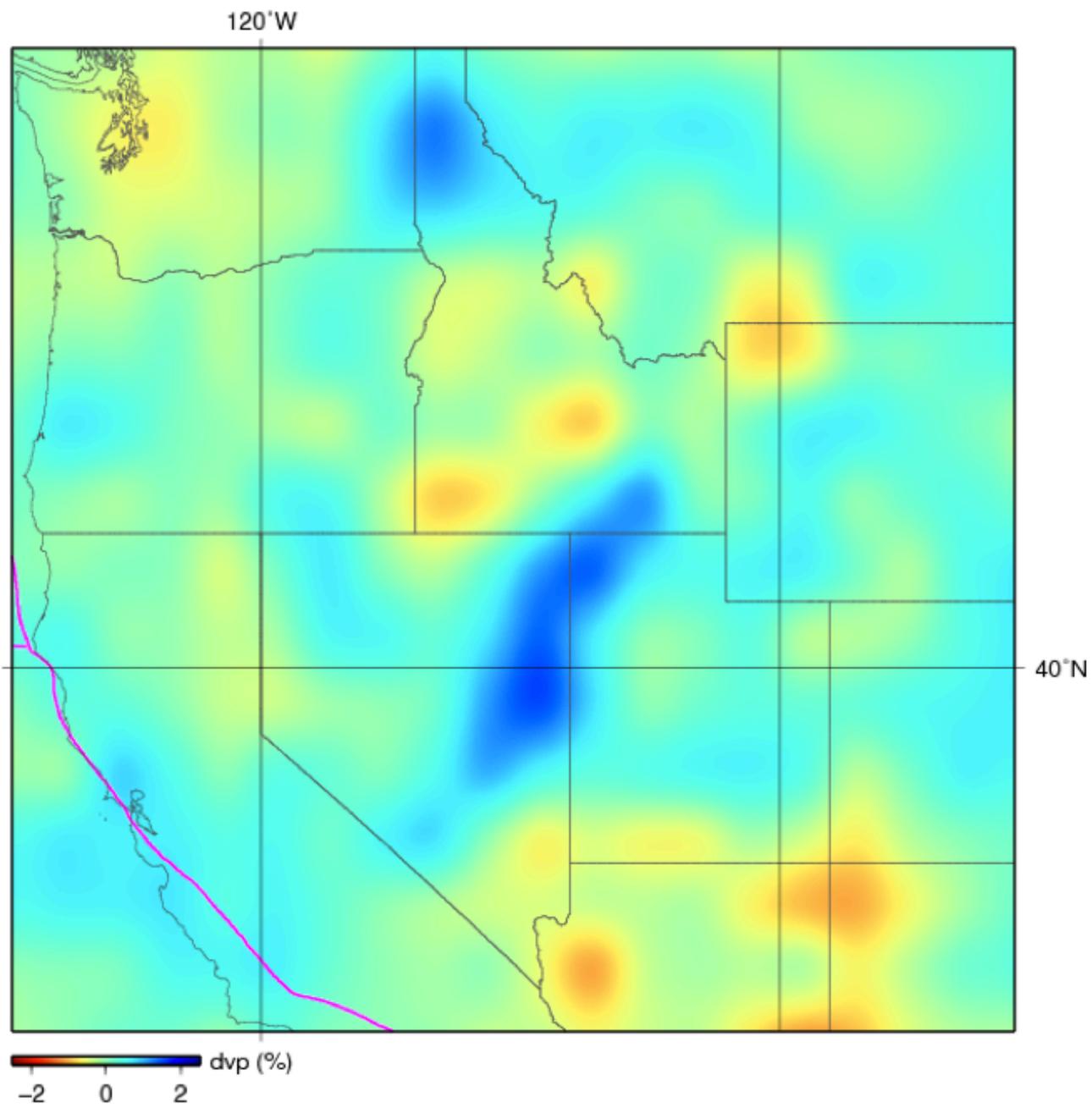


Depth 600 km

$\pm 1.50\%$

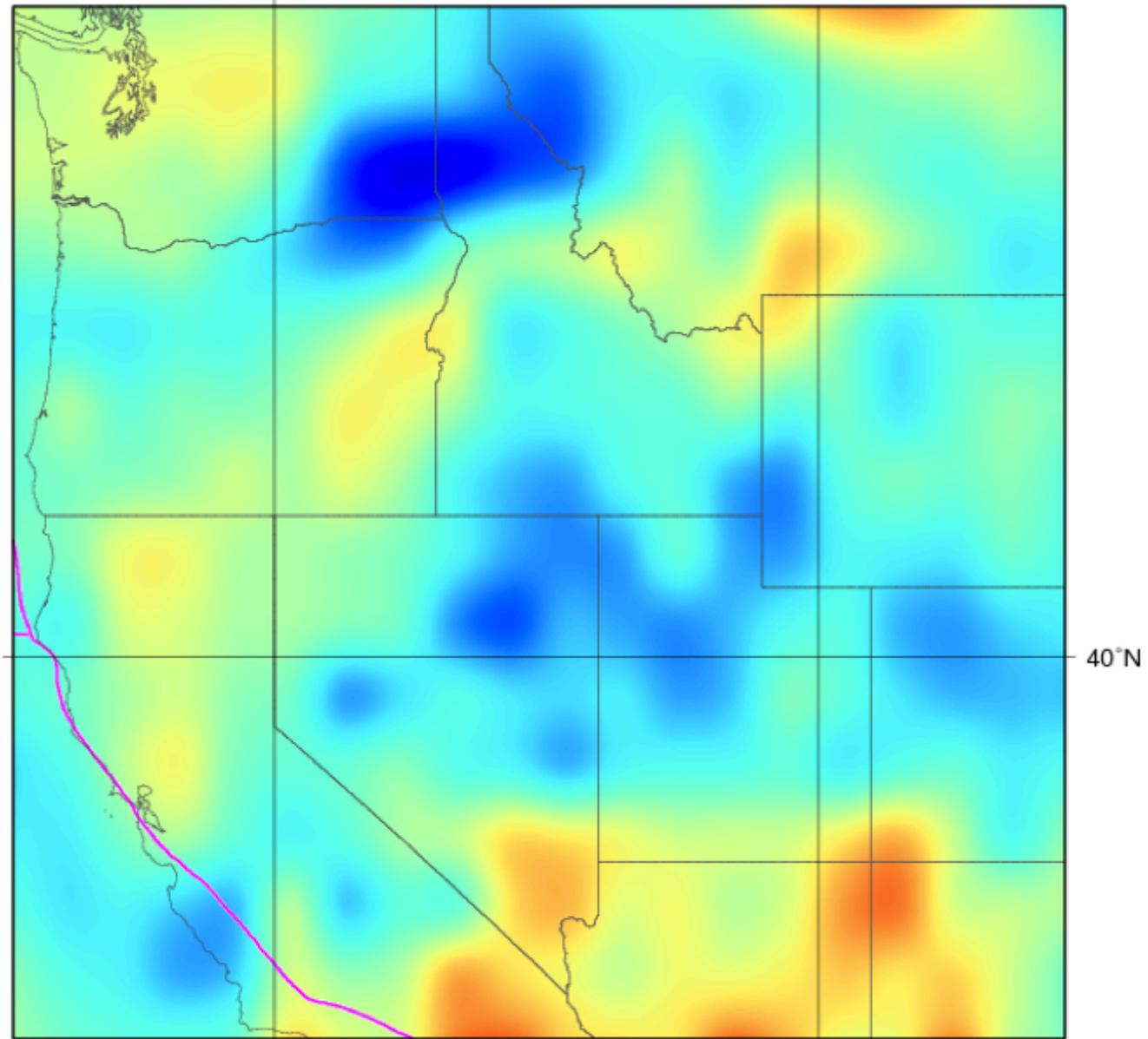


# United States, DNA09 dvP, Depth 600 km

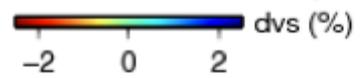


# United States, DNA10 dvS, Depth 600 km

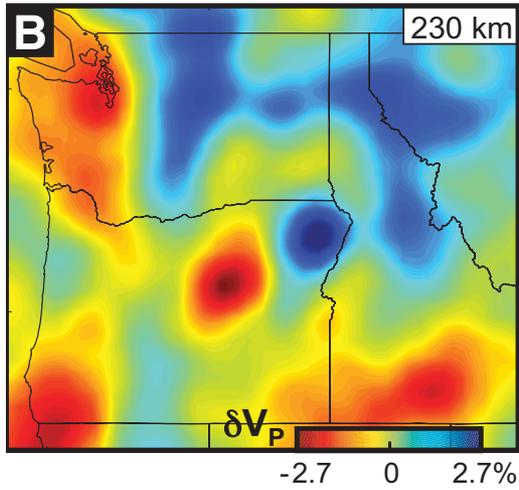
120°W



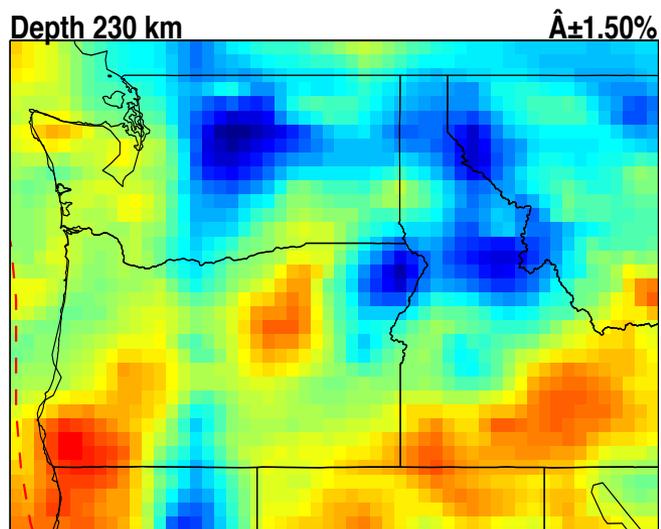
40°N



# Oregon Model (Schmandt and Humphreys)



# Burdick Model



"Relict Slab", DNA09 dVP, Depth 225 km

