Using K-Means Clustering to Compare Adjoint Waveform Tomography Models of California and Nevada

Abstract:

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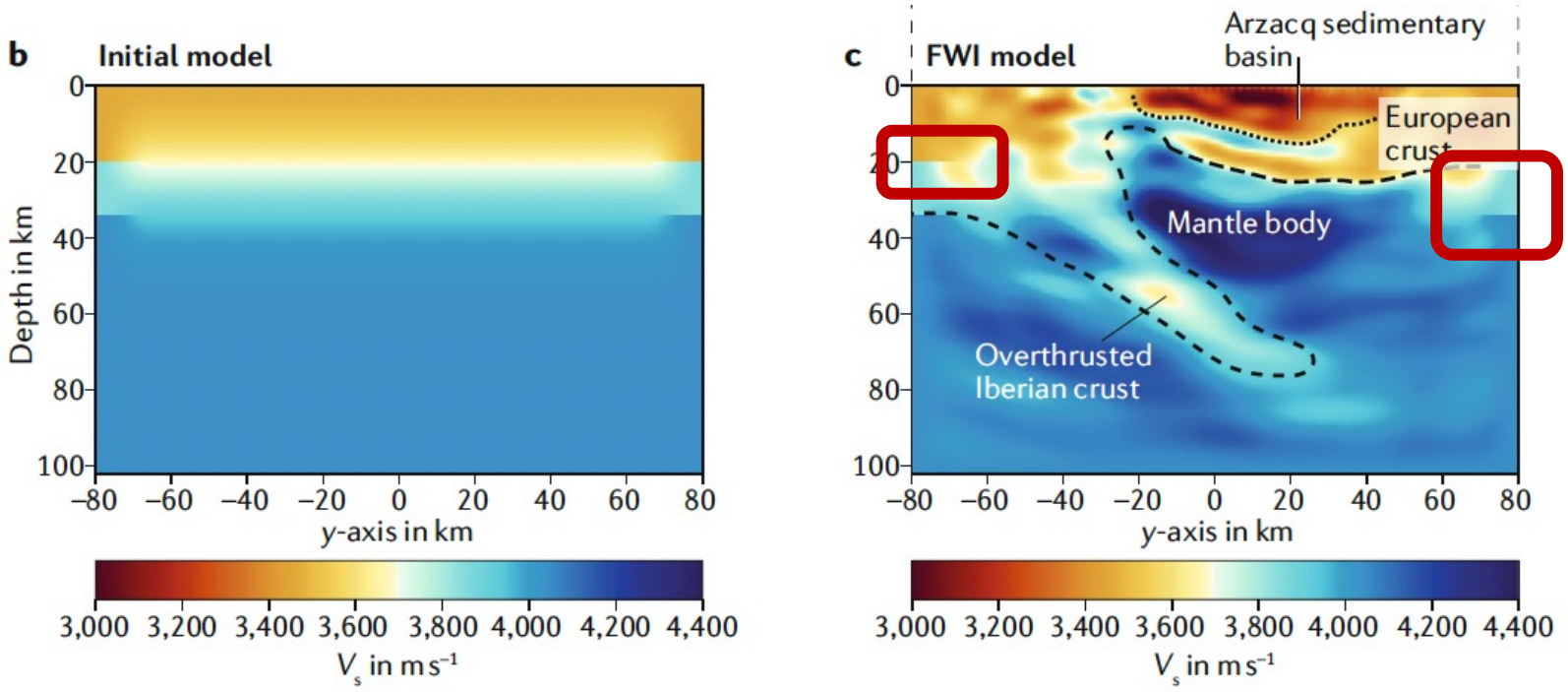
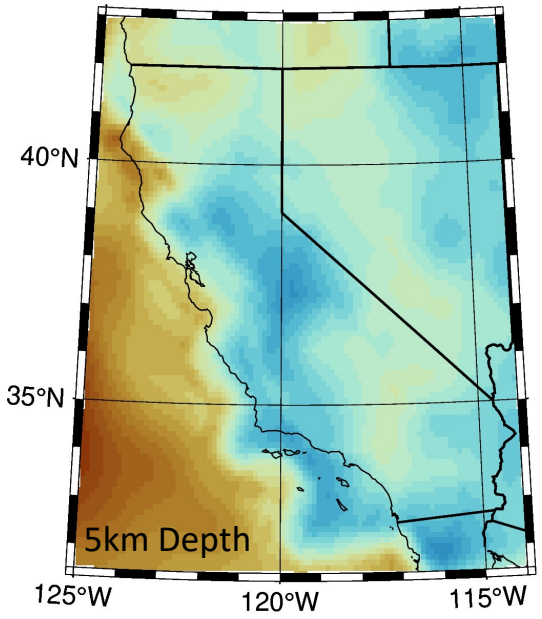
Full waveform inversion (FWI) methods require a starting model, but the effect the starting model has on the final model has not been studied extensively.



Tromp, 2020

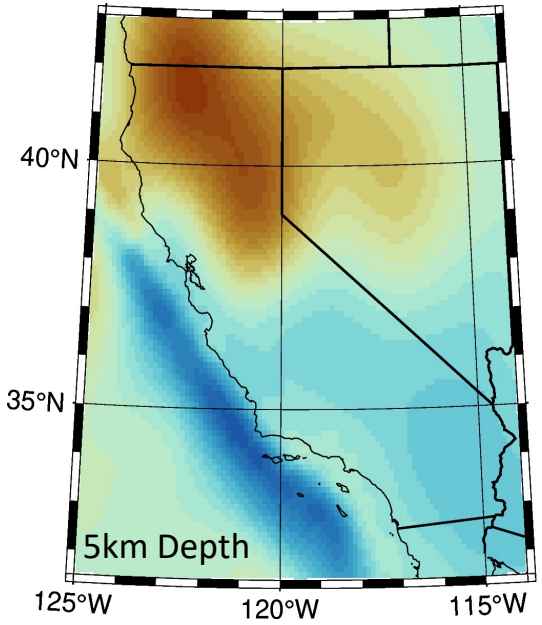
We begin with 3 different starting models, each computed on different scales and with different methodologies.

SPiRaL (Simmons et al., 2021)



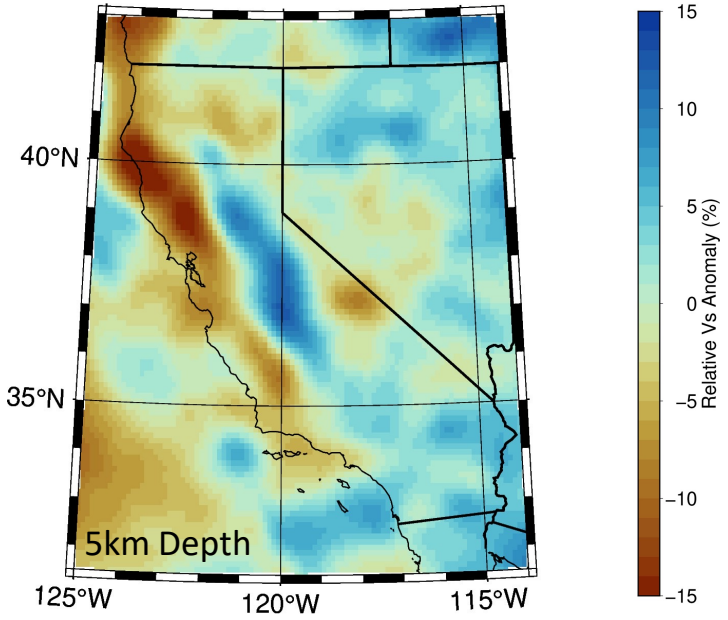
- **Global model**
- **P/S travel times, Rayleigh wave group velocities, vertical transverse anisotropy**

CSEM_NA (Krischer et al., 2018)



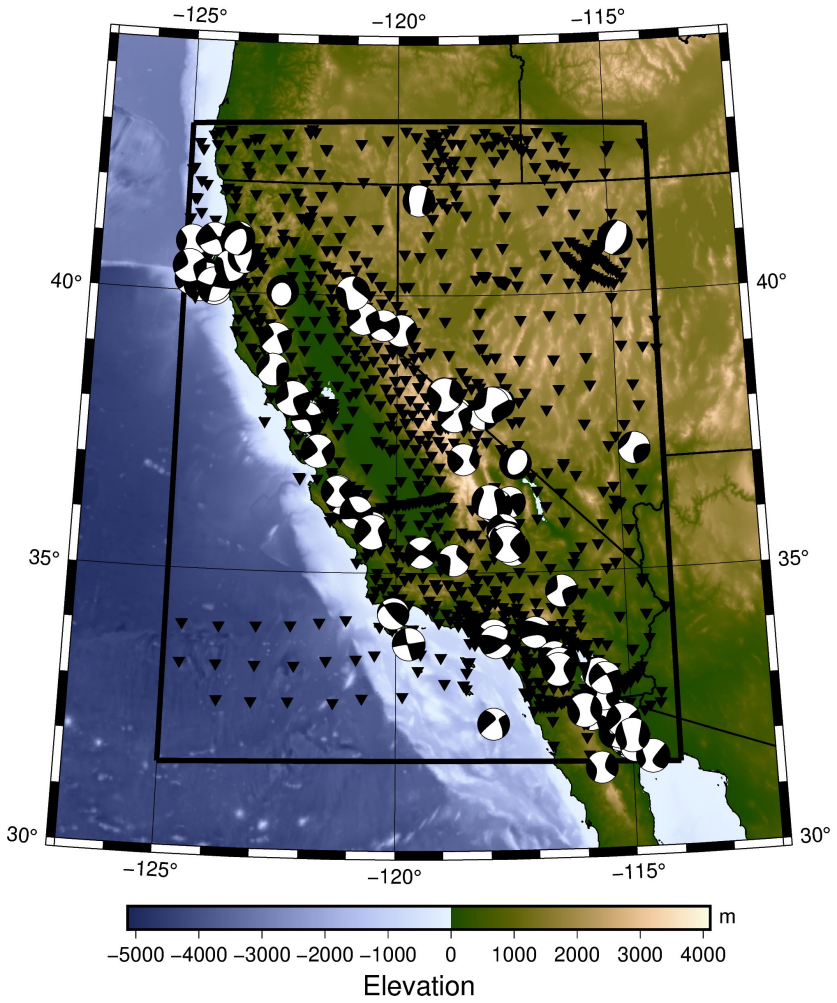
- **Regional model of North America and Europe**
- **Adjoint waveform tomography**

WUS256 (Rodgers et al., in review)



- **Regional model of the Western US**
- **Adjoint waveform tomography**

We use a dataset of 103 events recorded at over 1300 stations.



- Magnitude Range (Mw): 4.5-6.5
- Date Range: Jan 1 2000- Oct 31 2020
- Focal Mechanisms taken from GCMT

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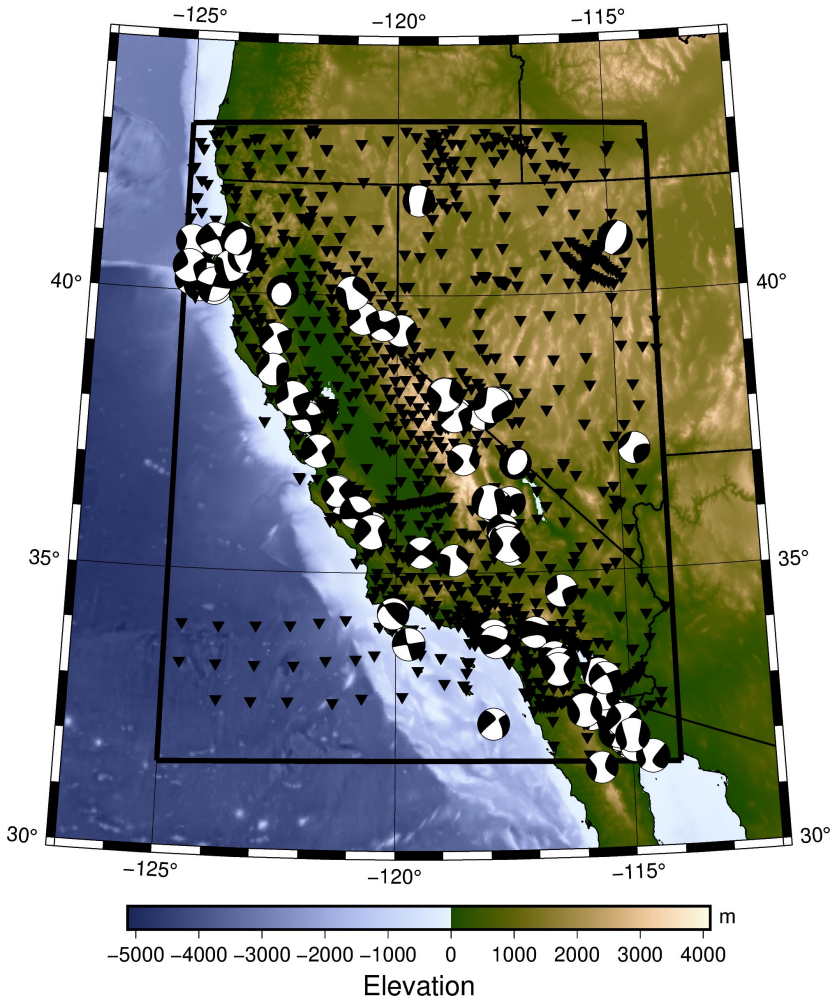
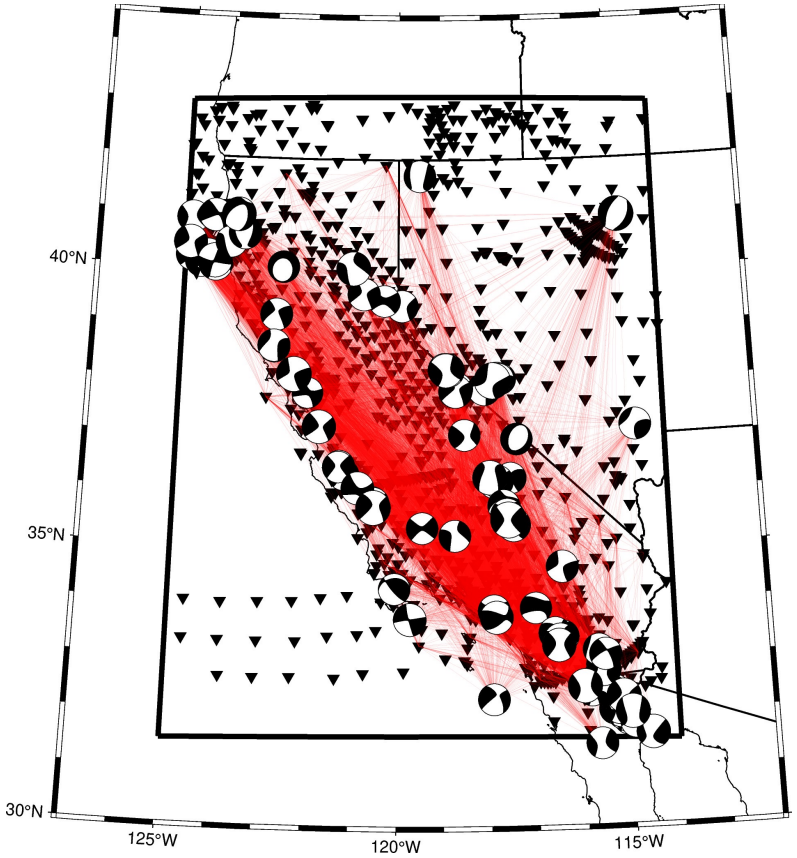
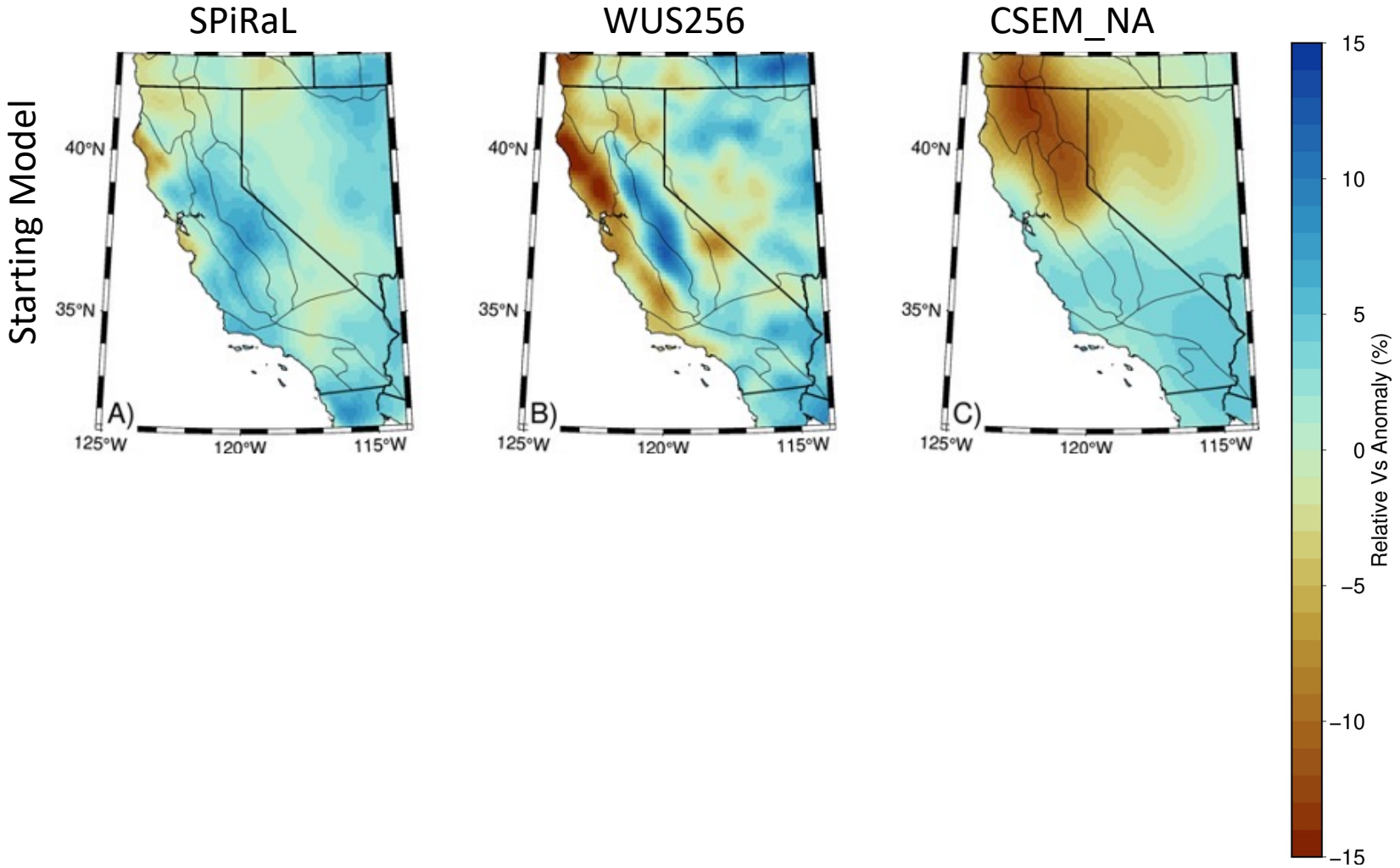




Model results show broad similarities in structure, but have differences that can be related to the starting model.



Depth: 5km

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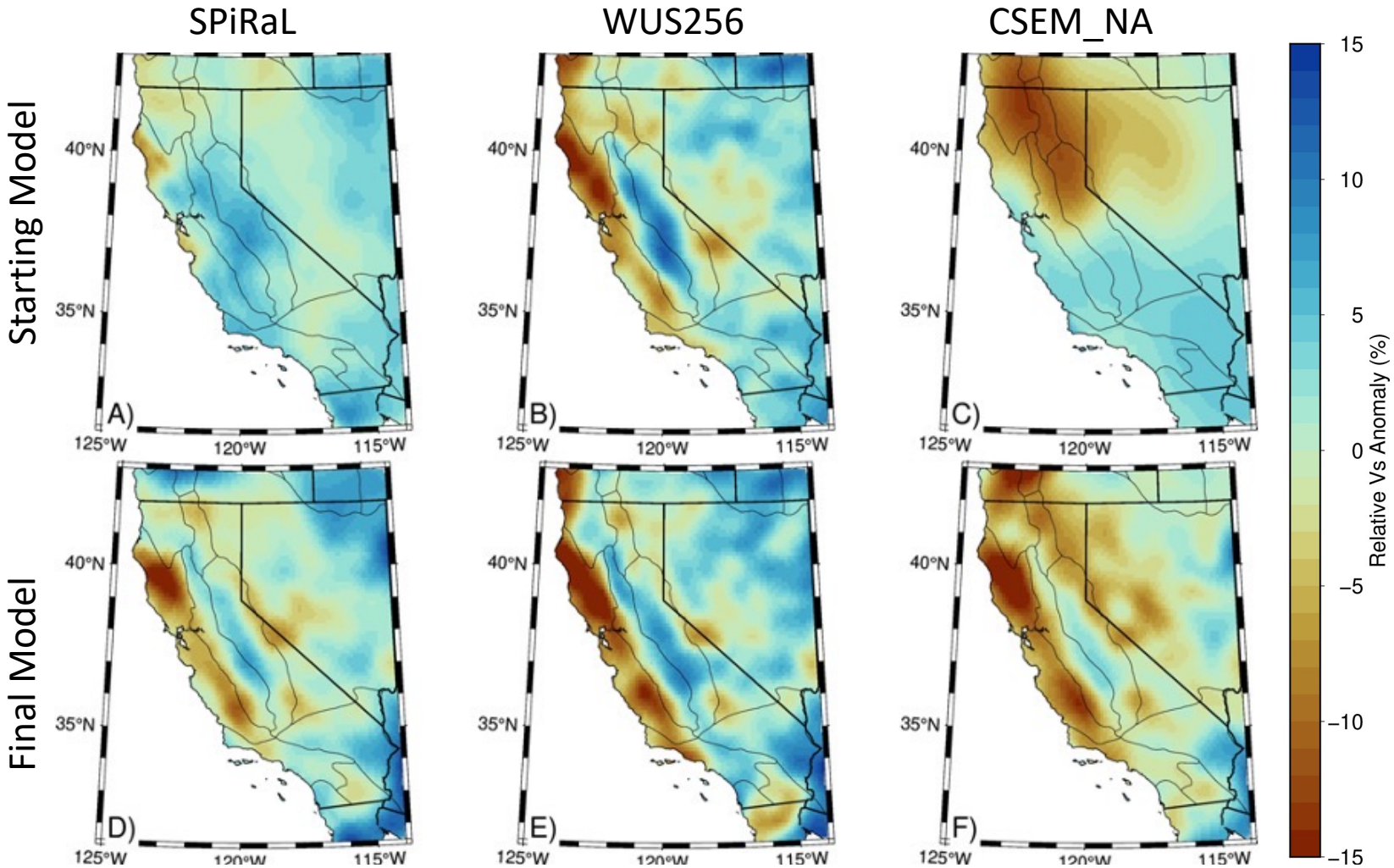
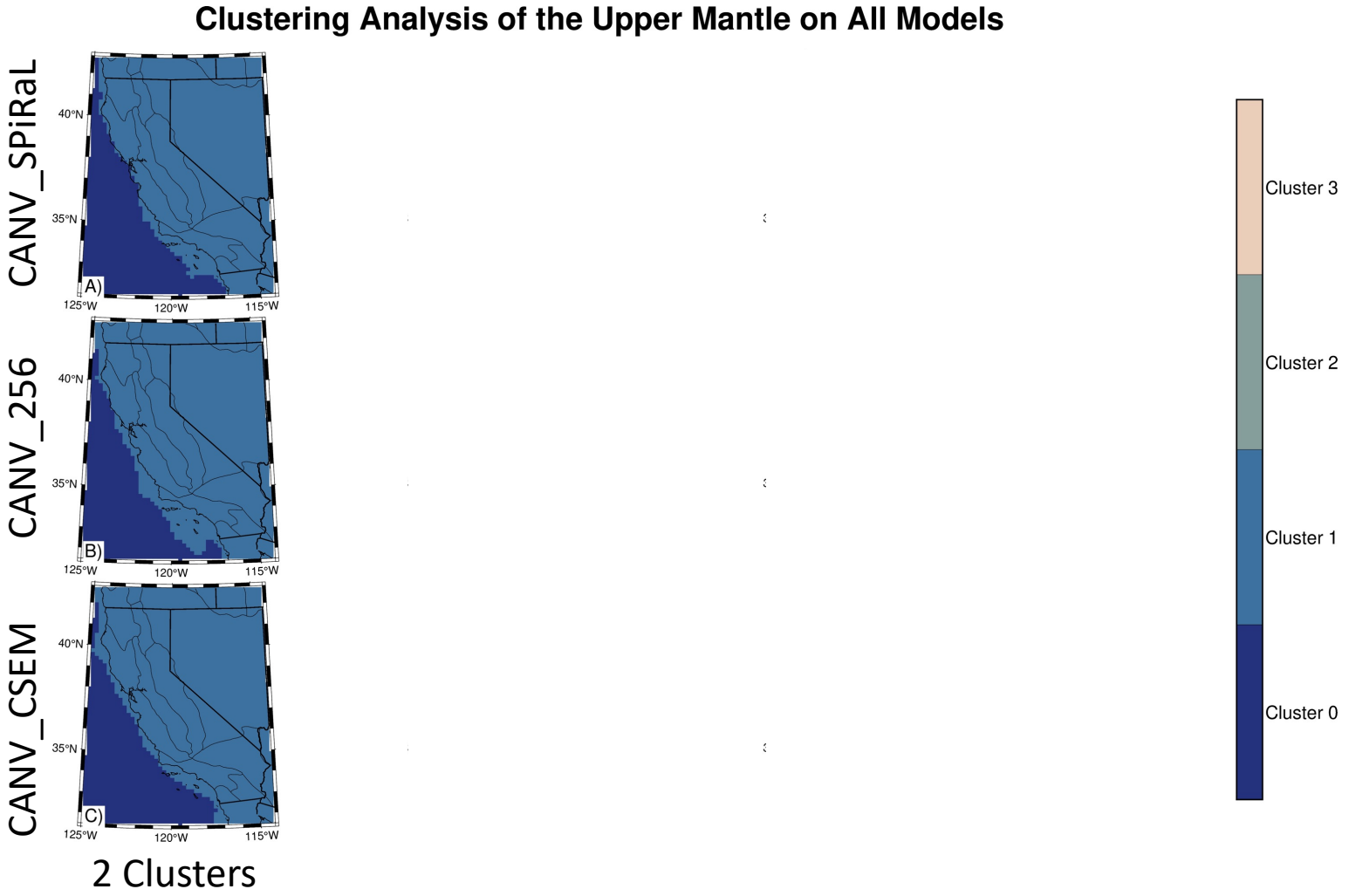


Depth: 5km

K-Means clustering analysis confirms the broad structural agreement of all 3 models.



Clusters of velocity profiles in the crust (0km-30km)

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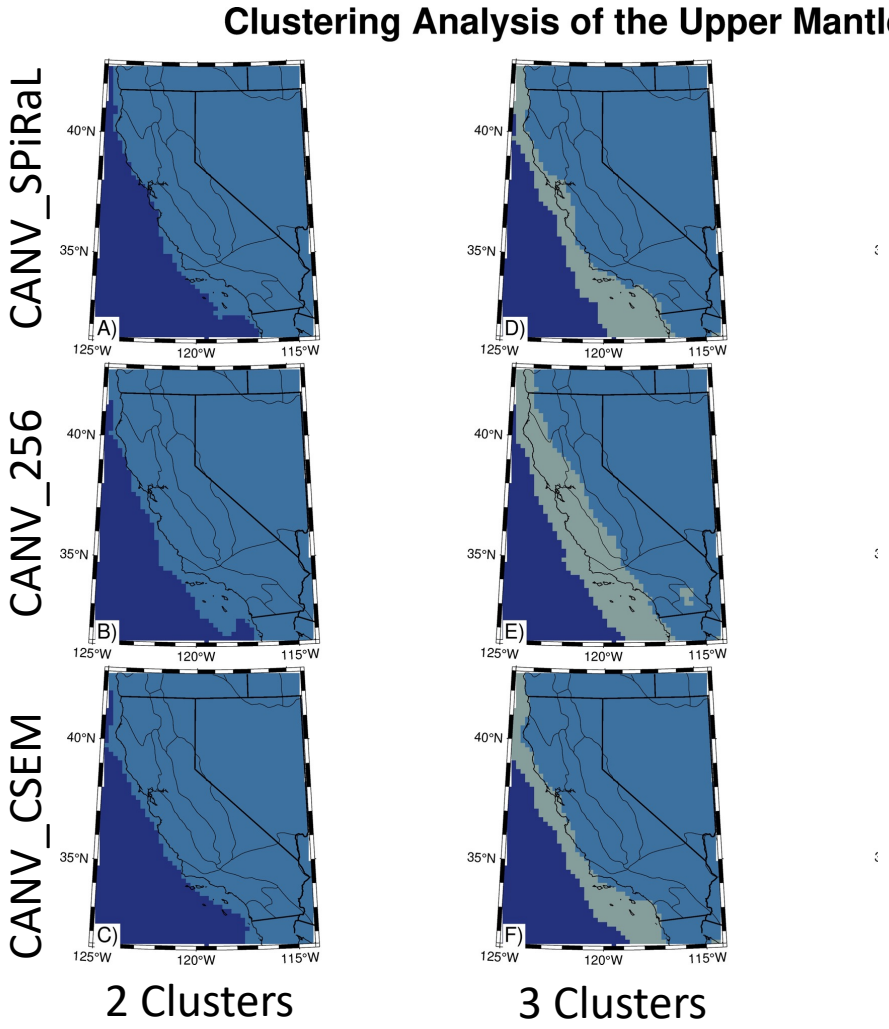

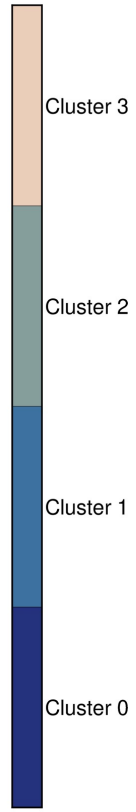

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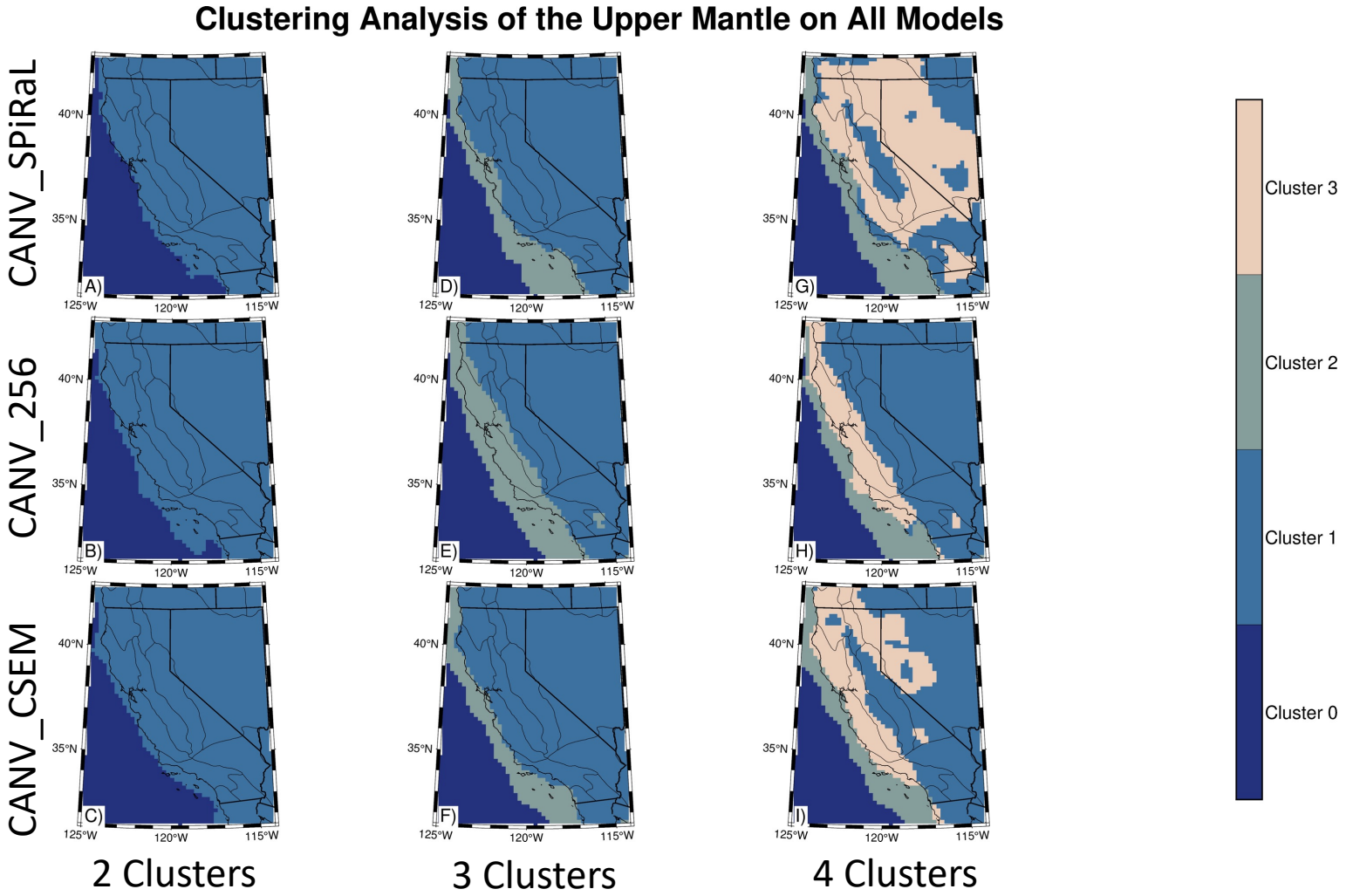

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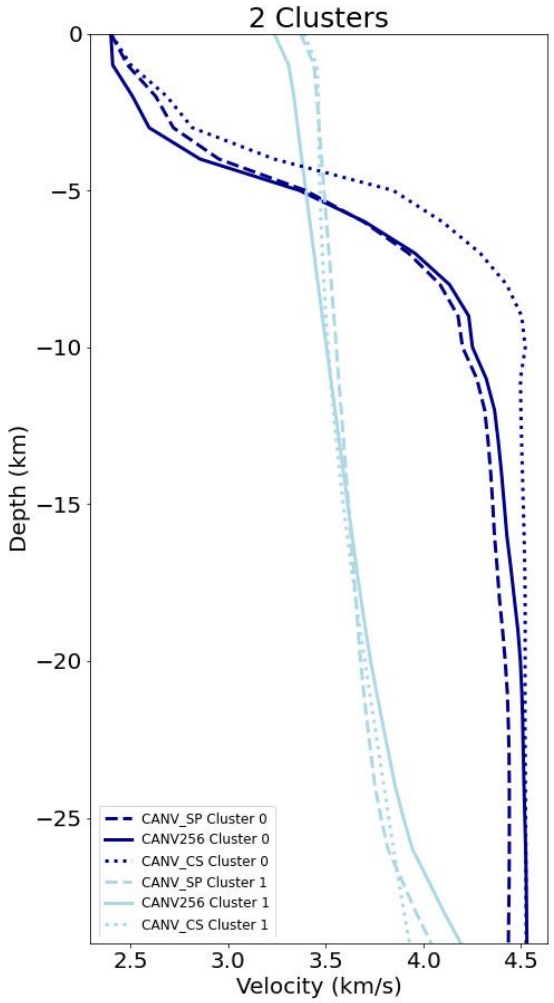

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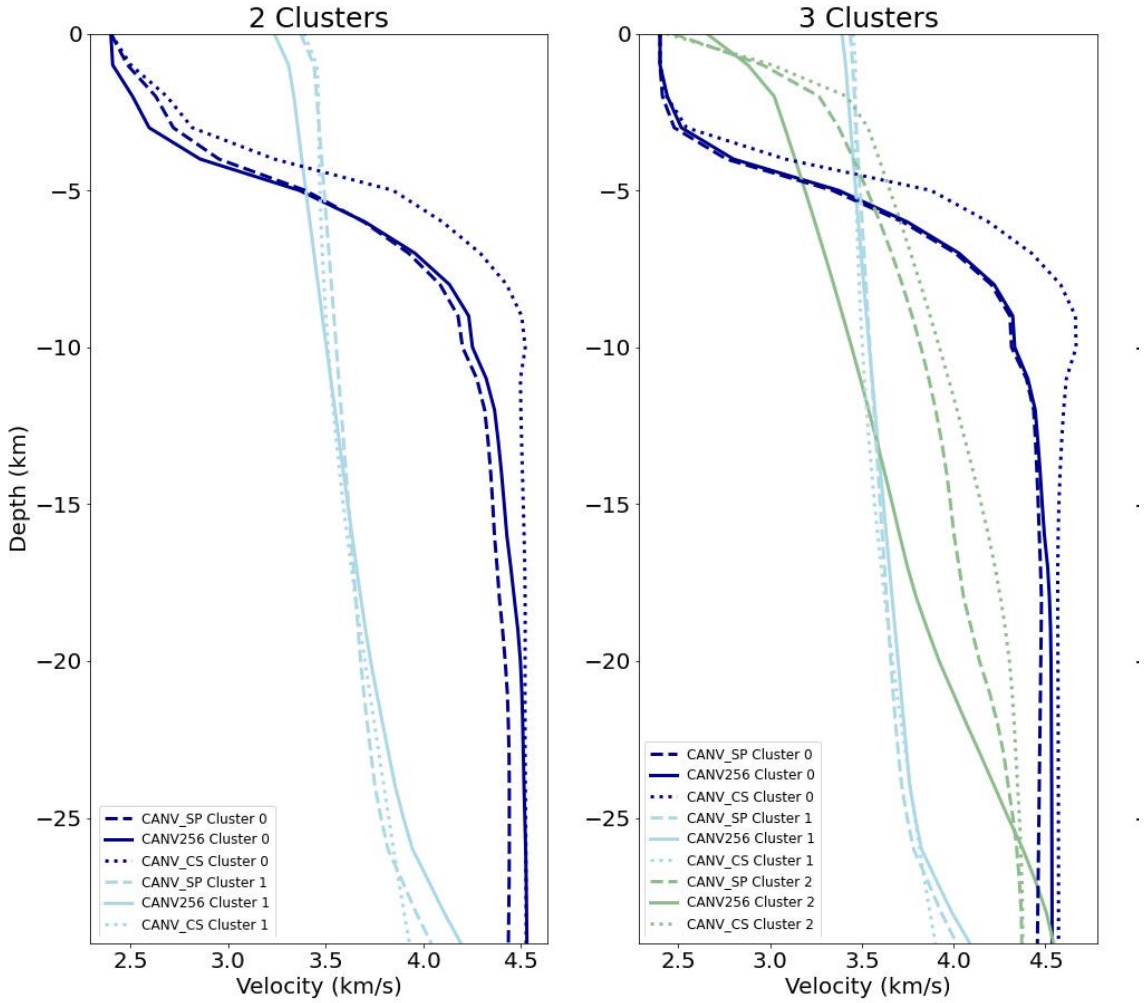

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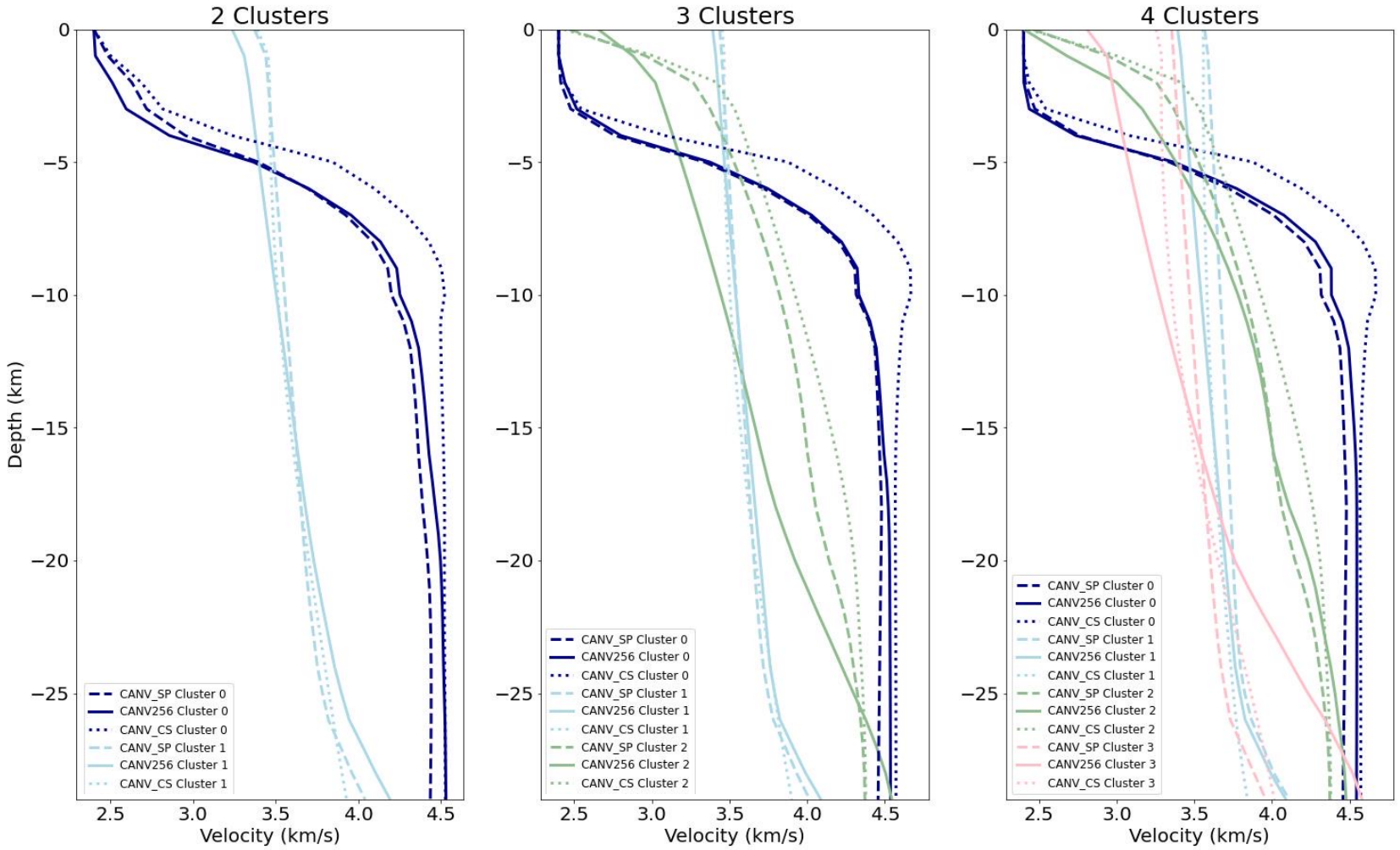
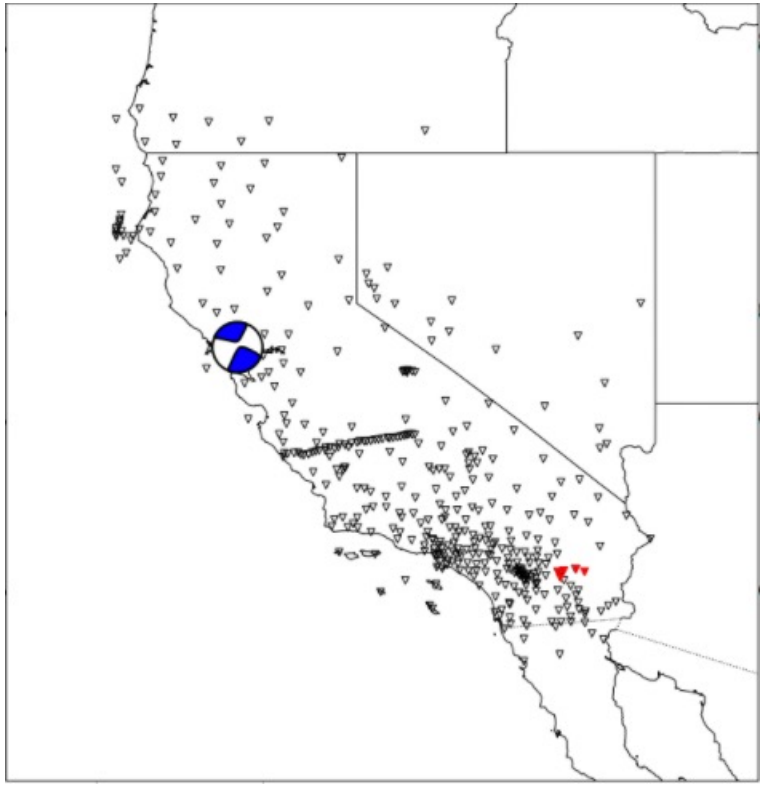


Waveforms for all three models also show similar levels of fit to the observed data.



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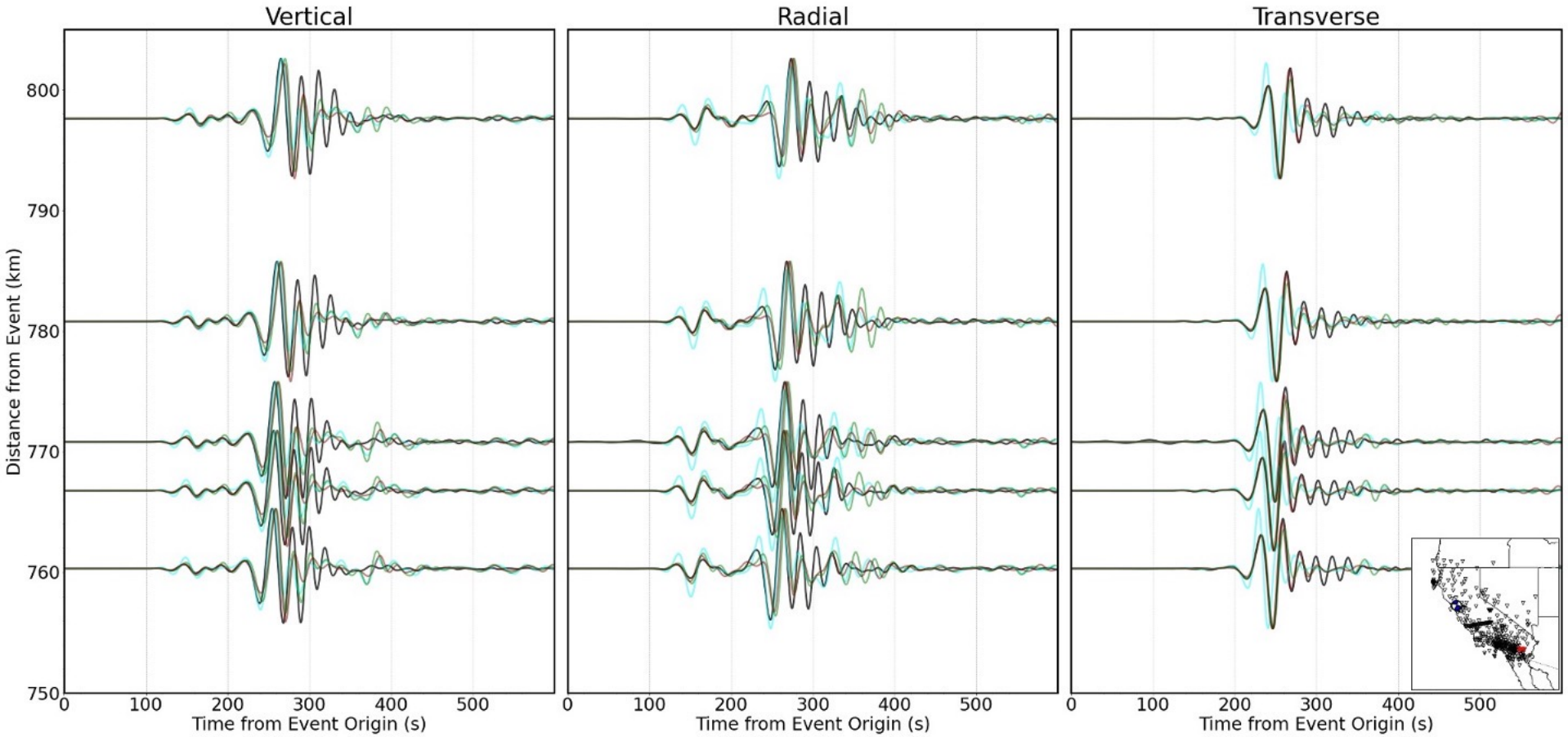

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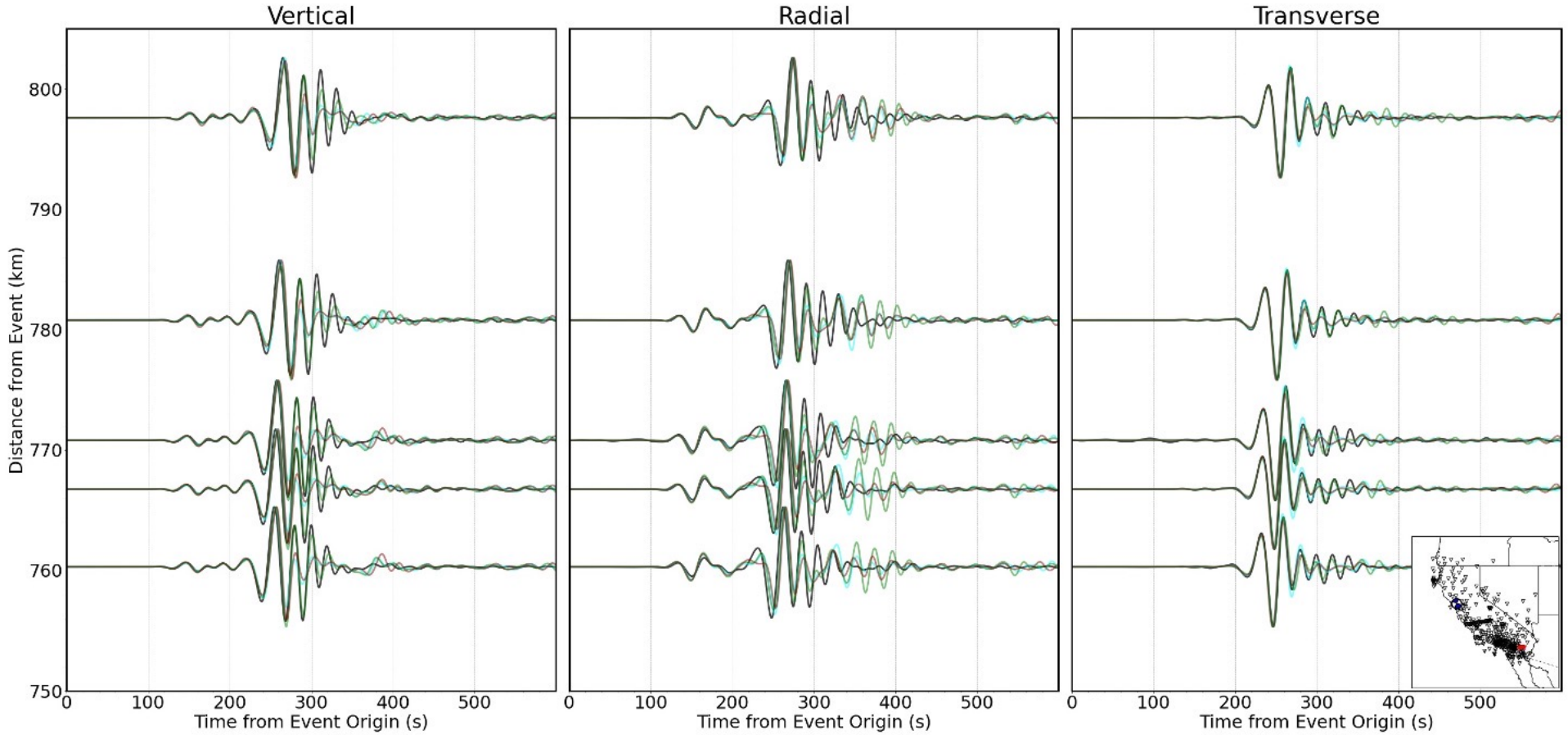

Observed	CANV_SPiRaL	CANV_256	CANV_CSEM

Questions/Comments:
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