

Update on East Pacific Rise and Juan de Fuca ‘Ridge-to-Trench’ surveys

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JdF R2T PIs: S. Carbotte, J.P. Canales, H. Carton, M. Nedimovic

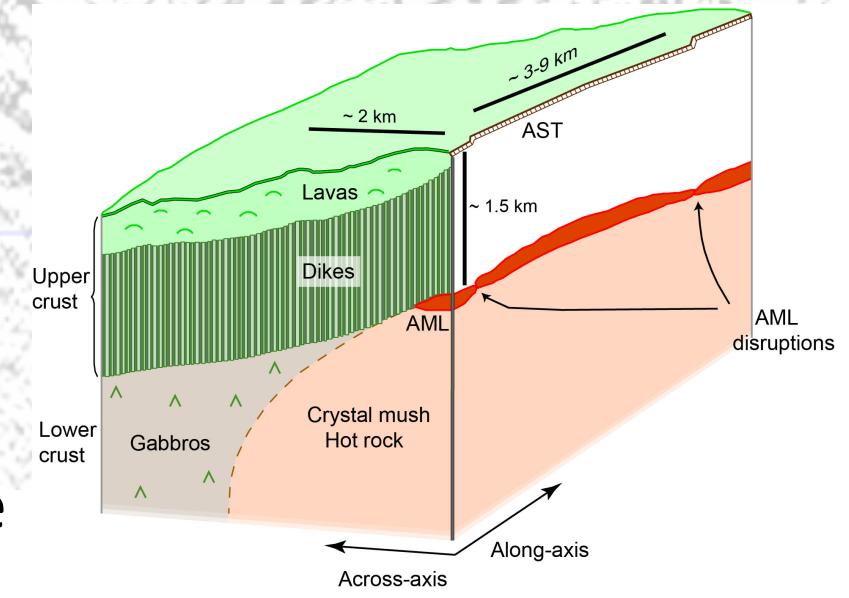
Juan de Fuca R2T/ Cascadia margin: upcoming AGU presentations

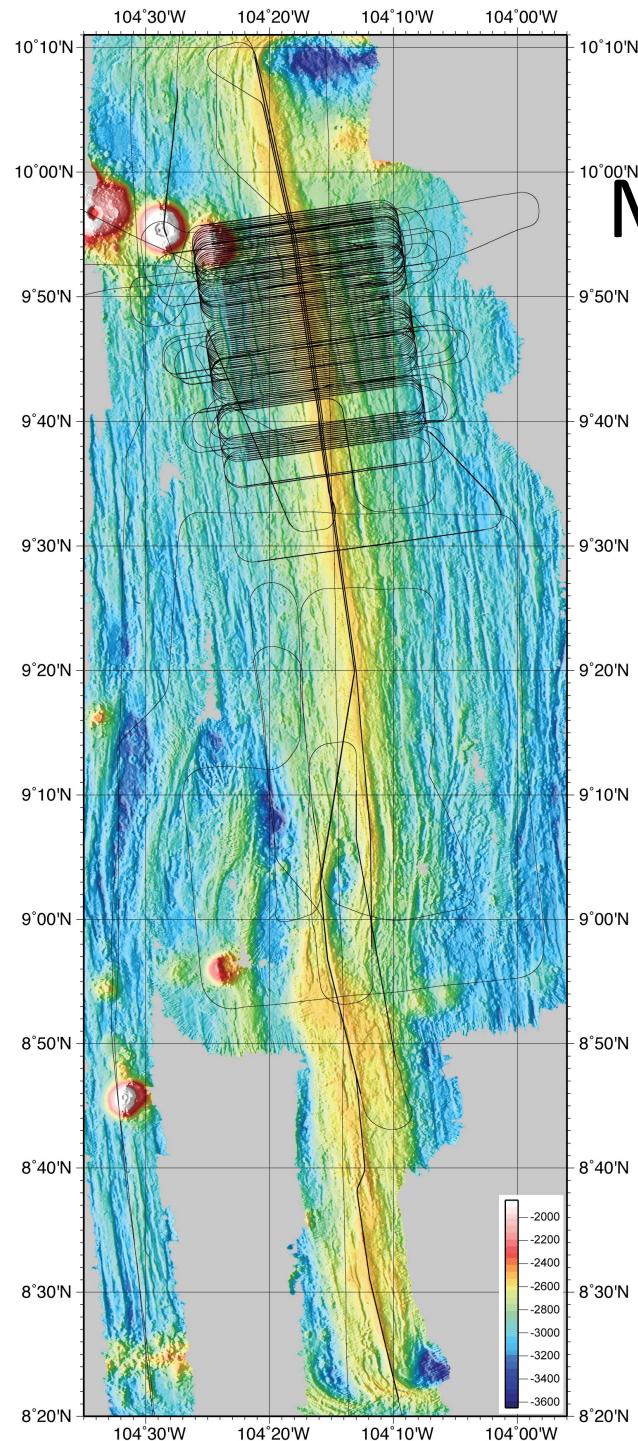
- Gibson et al. T51B-4614 **Analysis of Faulting and Sediment Velocity Characteristics Outboard of the Cascadia Deformation Front from Multi-Channel Seismic Data.**
- Canales et al. T51B-4615 **State of Hydration of the Juan de Fuca Plate Along the Cascadia Deformation Front from Controlled-Source Wide-Angle Seismic Data**
- Horning et al. T51B-4616 **Crustal structure and evolution of the southern Juan de Fuca plate from wide-angle seismic data: Insights into the hydration state of the incoming plate off Cascadia subduction zone**
- Han et al. T51B-4617 **Seismic Reflection Imaging of Subduction Bending-Related Faults at Cascadia**

Friday, December 19, 08:00 AM - 12:20 PM

East Pacific Rise 3D seismic survey

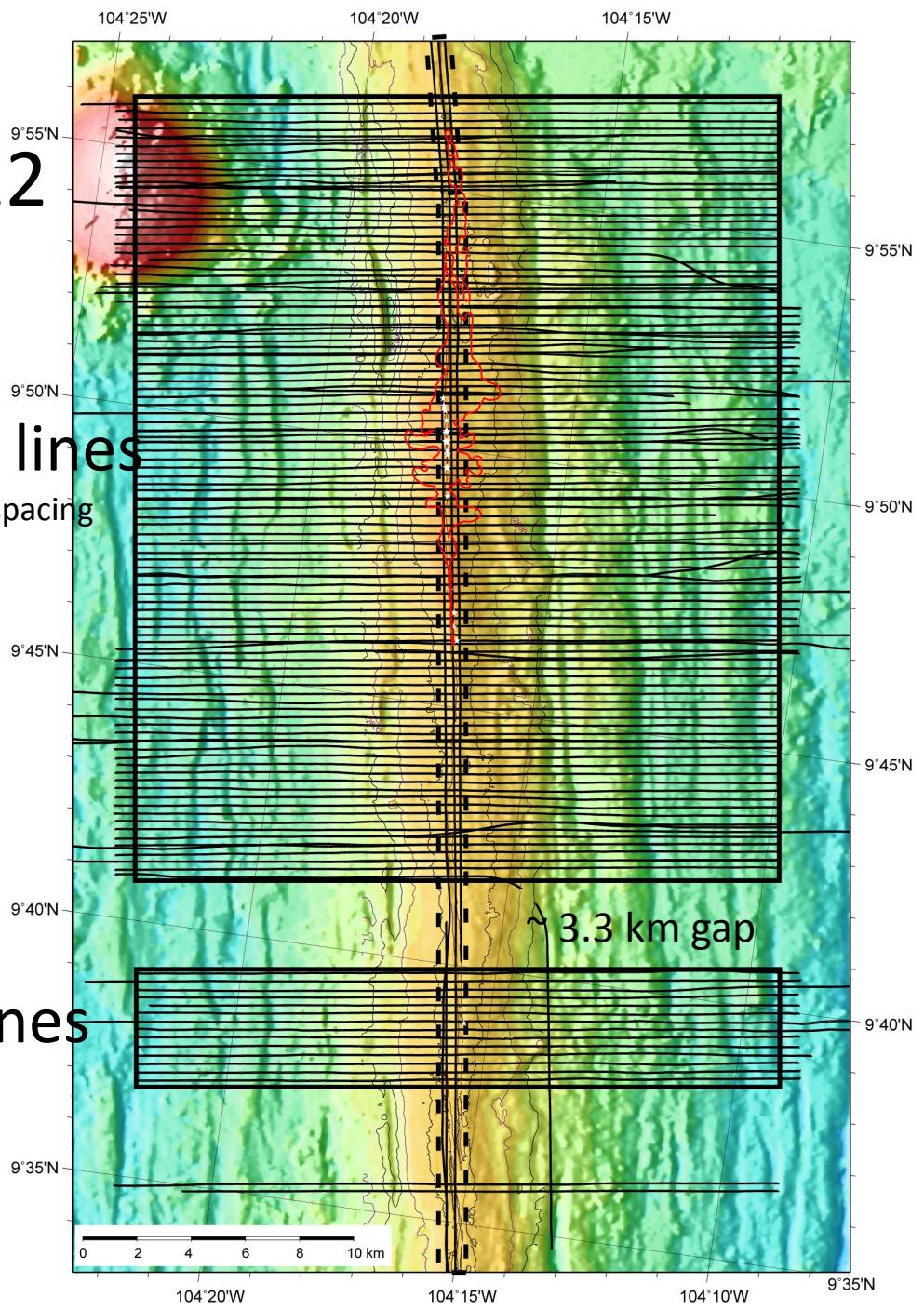
- 9-10°N EPR, fast-spreading Ridge 2000 Integrated Study Site, centered on 9°50'N where two documented eruptions occurred in 1991-92 and 2005-06
- Goals: Imaging of the axial magma lens (=AML) and uppermost crust at scale comparable with seafloor observations (volcanic, hydrothermal); resolving spatial variations in melt content of the AML; study of Moho transition zone; baseline for repeat survey of magma movement



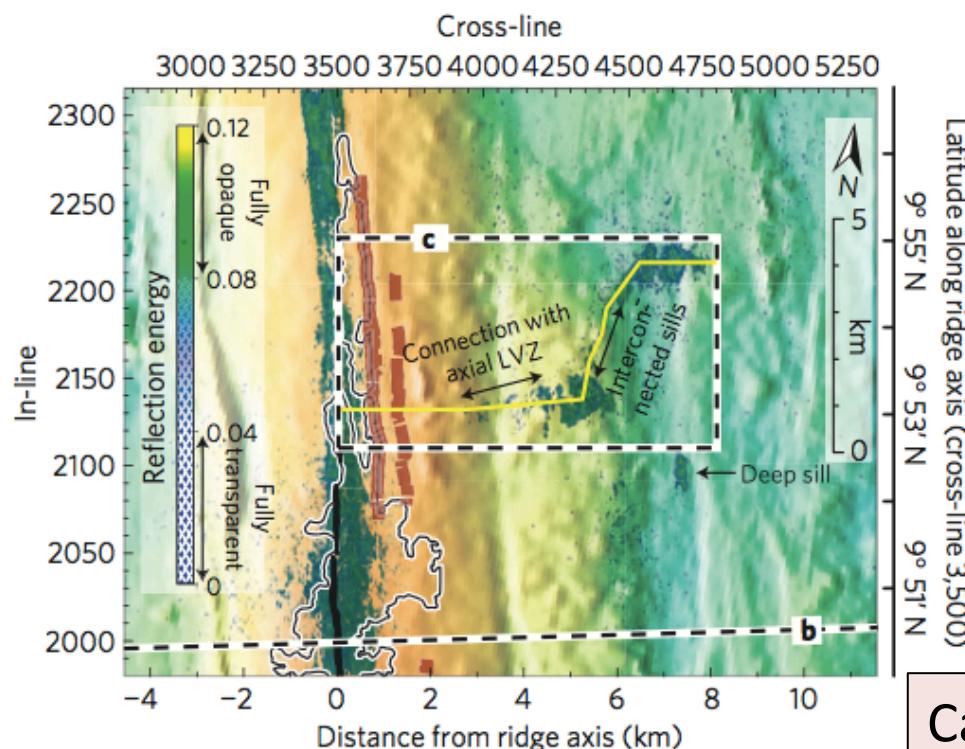


Cruise MGL0812

93 ½ P lines
at 300m spacing

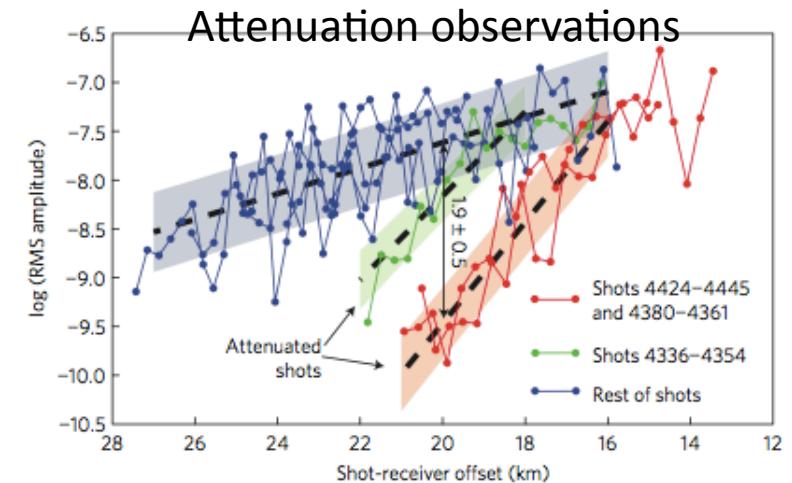
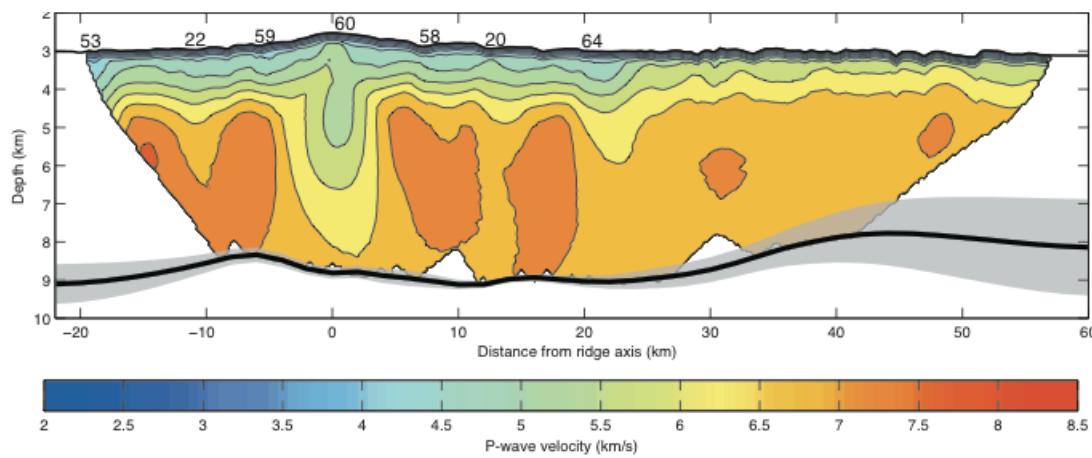


Discovery of off-axis magma lenses (=OAMLs)

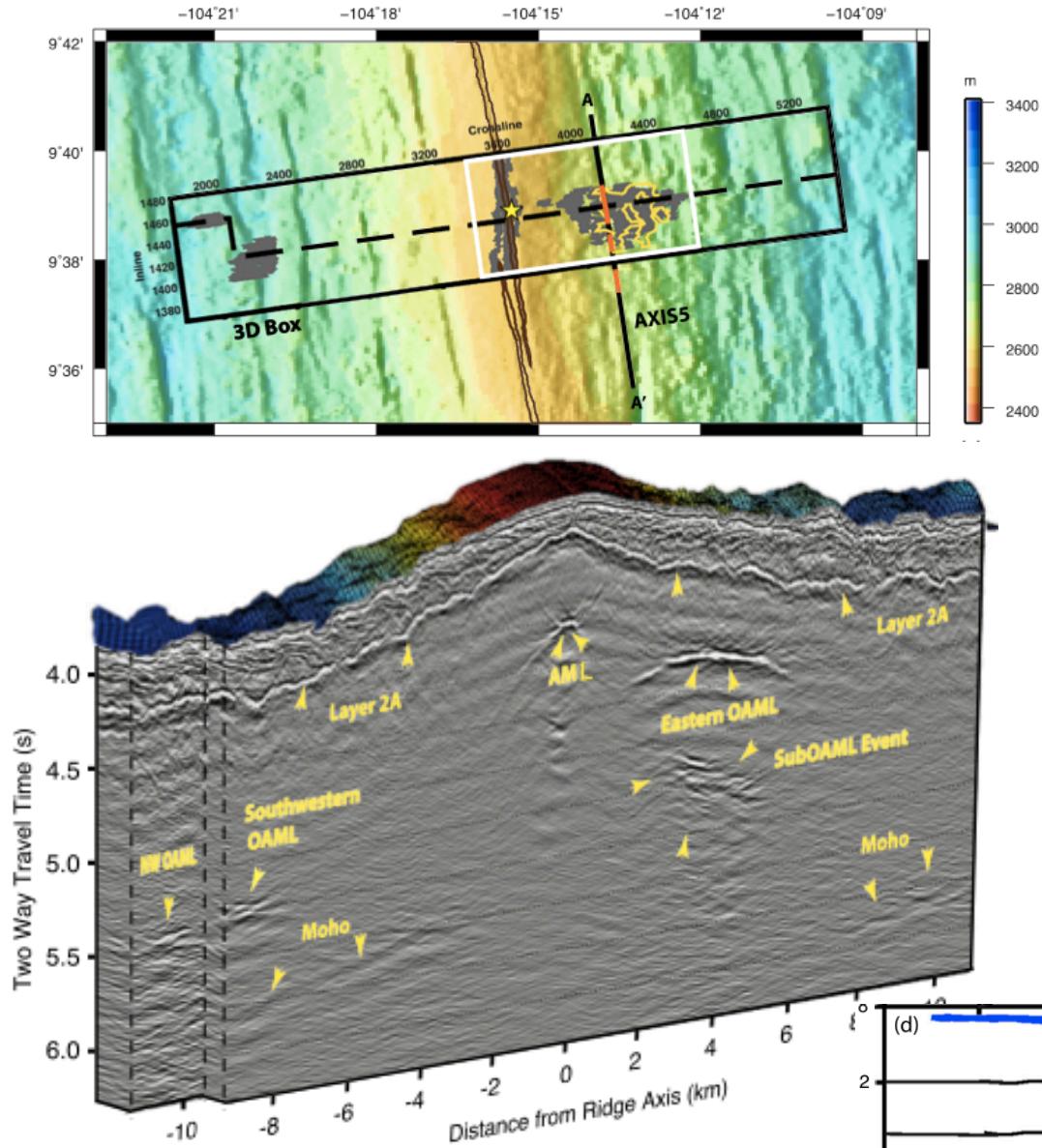


OAMLS within quadrant of northern box

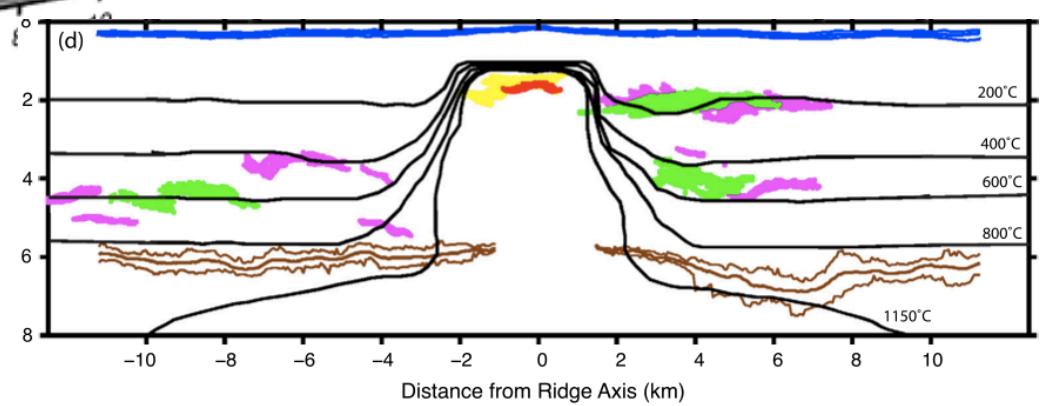
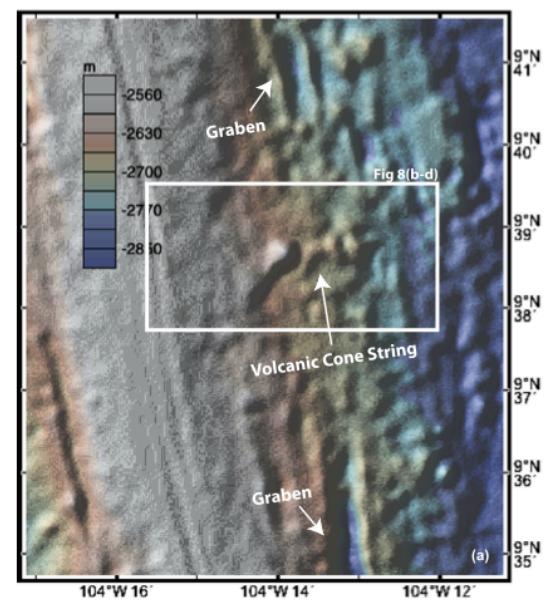
Canales et al., Nature Geoscience, 2012



Han et al., EPSL, 2014

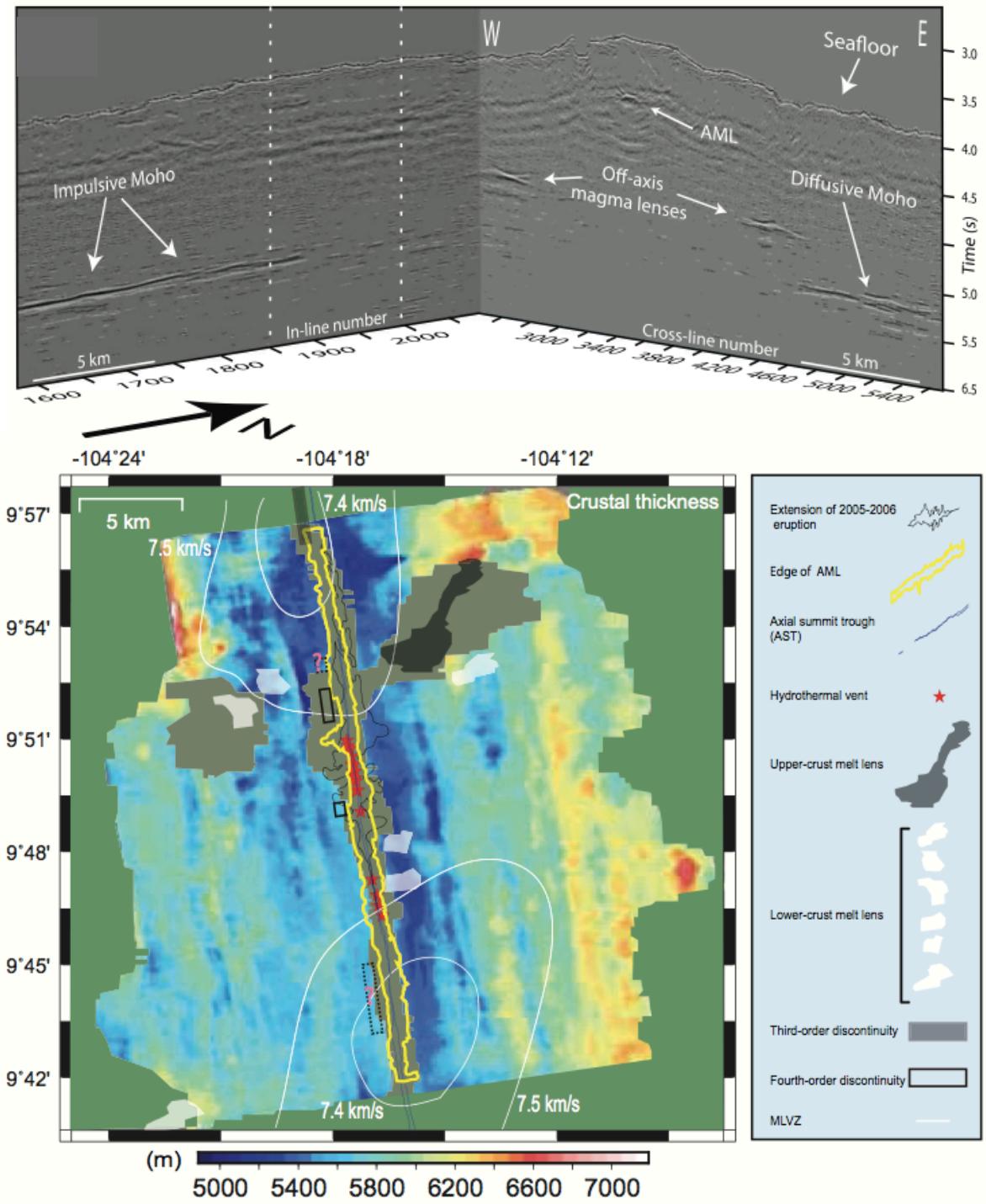
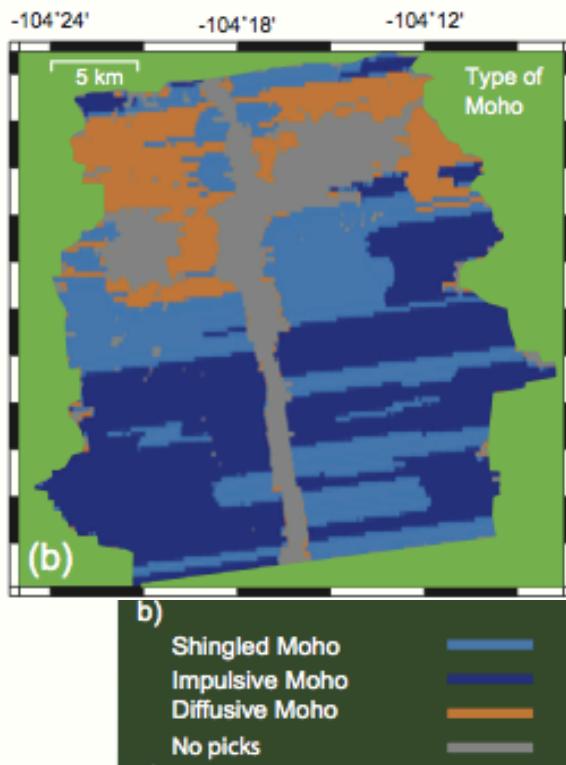


OAMLS, Moho and sub-OAML events within southern box

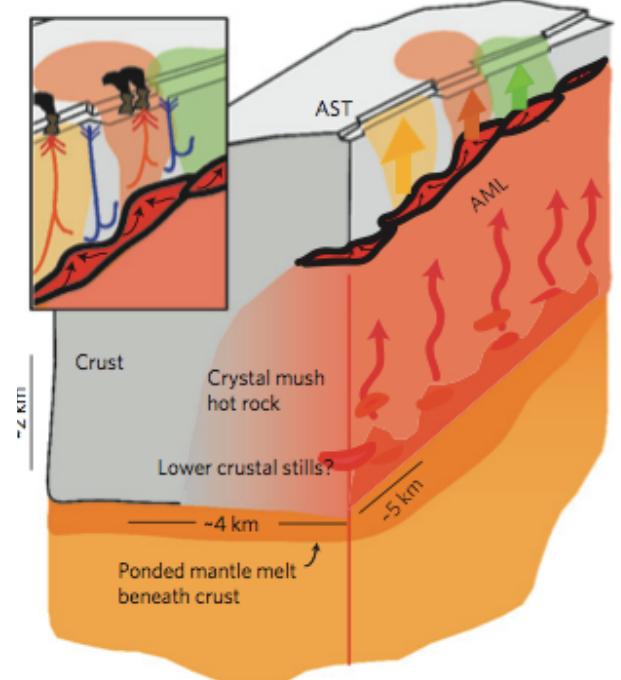
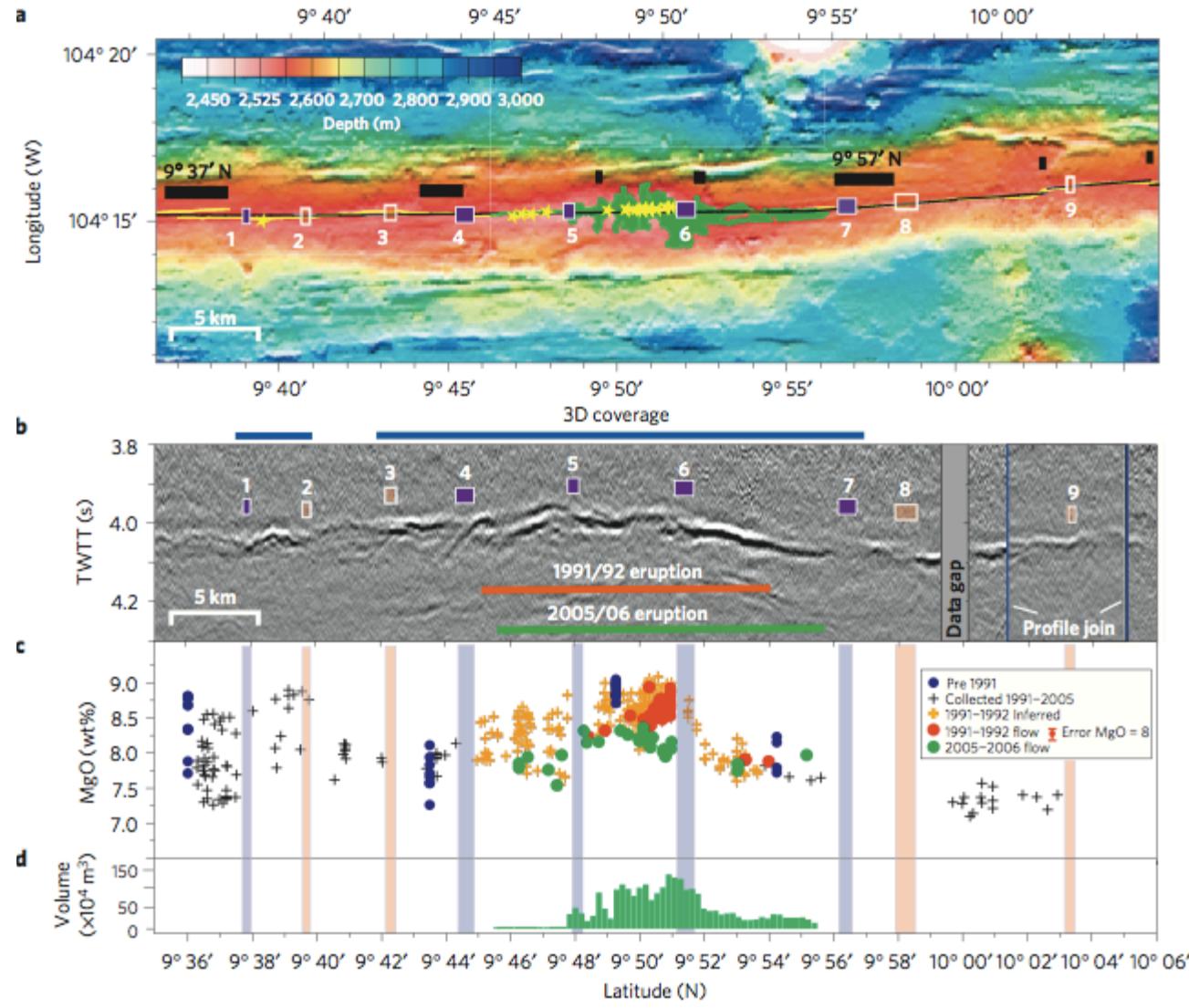


Moho character and crustal thickness

Aghaei et al., G3, 2014



Relationship between seafloor segmentation and partitioning of AML

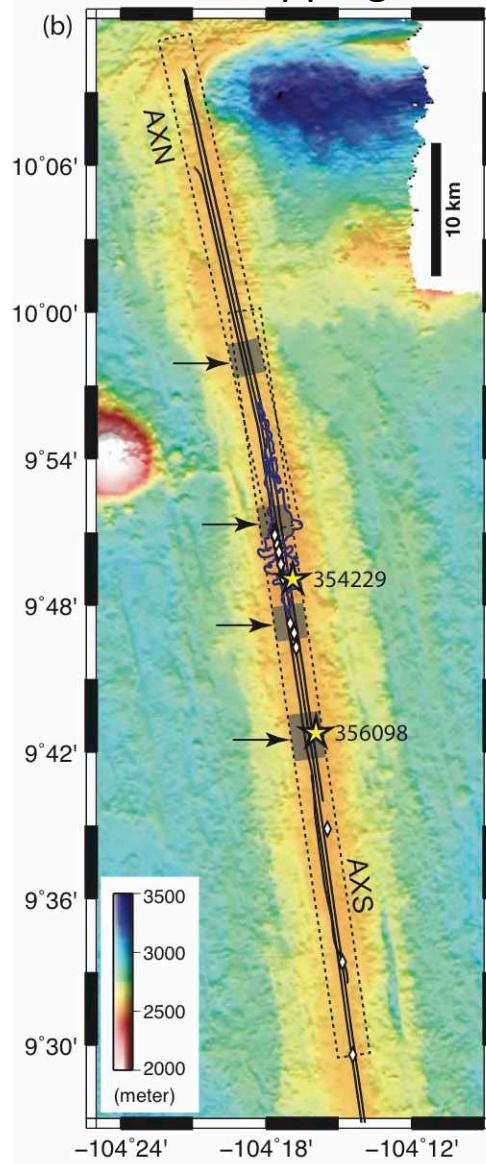


Carbotte et al.,
Nature Geoscience,
2013

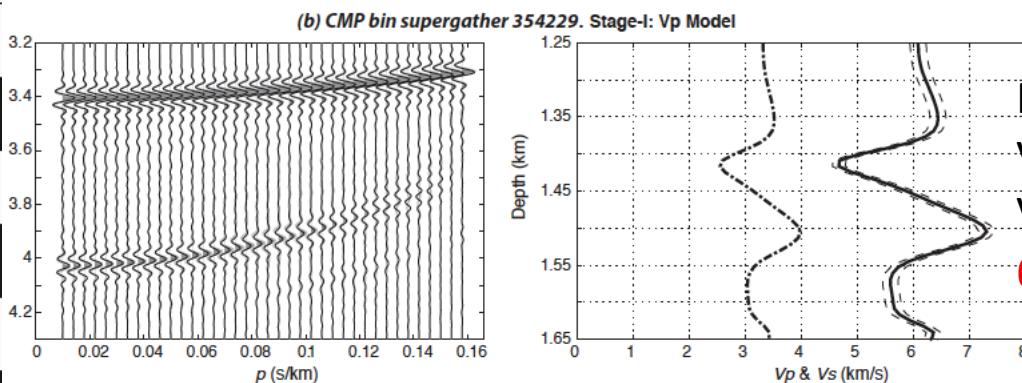
Along-axis variations in physical properties of AML & signature of eruption

- Xu et al. (JGR, 2014): 1D full-waveform inversion and partial-offset stacking for P-wave reflection and P-to-S converted phase at AML
- Marjanovic et al. (submitted to GJI): Industry-type AVO analysis using intercept-slope crossplotting, and partial-offset stacking

PAML-S mapping

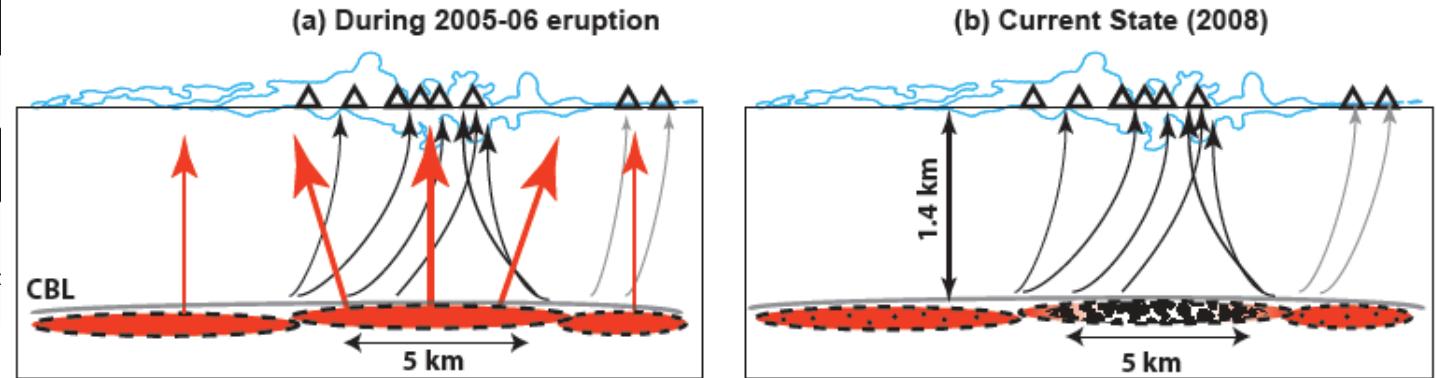


1D FWI results



Melt-poor site:
 $V_p=4.52-4.82 \text{ km/s}$,
 $V_s=2.0-3.0 \text{ km/s}$,
6-41 % melt fraction

Melt-rich site:
 $V_p=2.95-3.23 \text{ km/s}$,
 $V_s=0.3-1.5 \text{ km/s}$,
71-98 % melt fraction



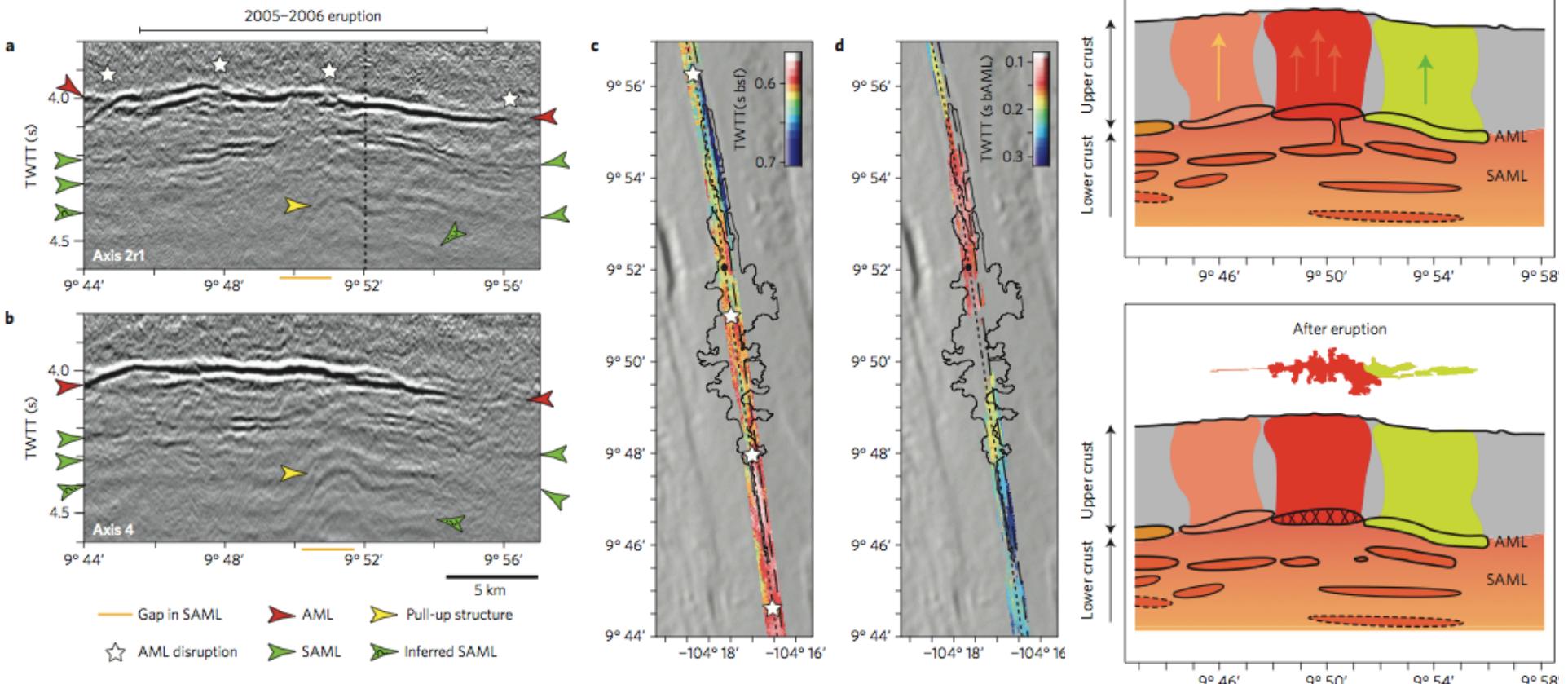
Xu et al., JGR, 2014

melt-rich AML	melt-poor AML (connected crystals)
2005-2006 eruption extent	Hydrothermal vent
	Hydrothermal circulation
	Lava eruption

Eruption scenario

Discovery of magma lenses within lower crust below the AML (SAMLs)

Marjanovic et al., Nature Geoscience, 2014



AML volume 9°42'-57'N

- Time slices across seafloor and AML (shallowest AML time ~3.88 s)
- Movie through volume from N to S (inline direction)
- Crossline over ridge axis
- 3D view of trimmed volume with transparency
- (No picks yet)

East Pacific Rise 3D project: upcoming AGU presentations

- Nedimovic et al. V22A-01 **Crustal Thickness and Moho Character of the Fast-Spreading East Pacific Rise Between 9°37.5'N and 9°57'N From Poststack and Prestack Time Migrated 3D MCS data**
- Carton et al. V22A-02 **Axial Magma System Geometry beneath a Fast-Spreading Mid-Ocean Ridge: Insight from Three-Dimensional Seismic Reflection Imaging on the East Pacific Rise 9°42' to 9°57'N**

*Tuesday, December 16, 10:20 AM - 12:20 PM
Marriott Marquis Salon 8*