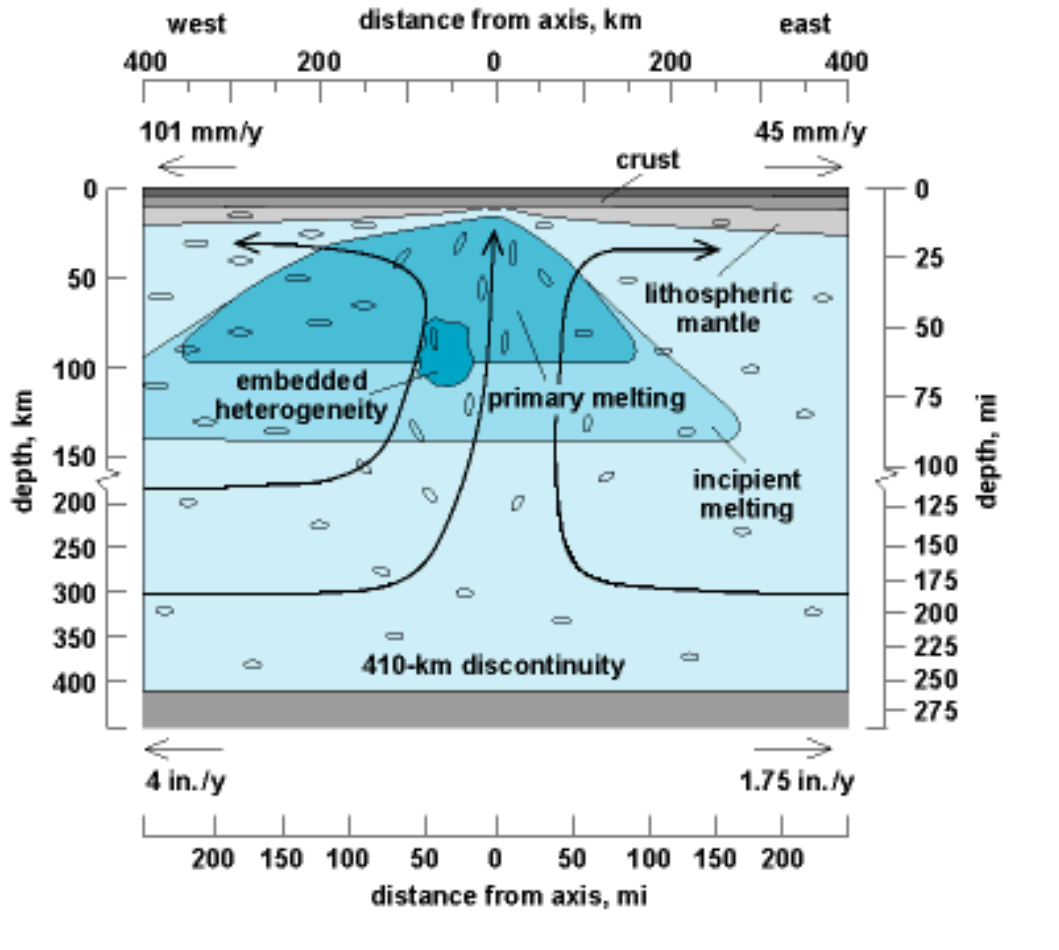
# Magmatic processes at Mid-Ocean Ridges: Insights from a recently erupting segment of the East Pacific Rise

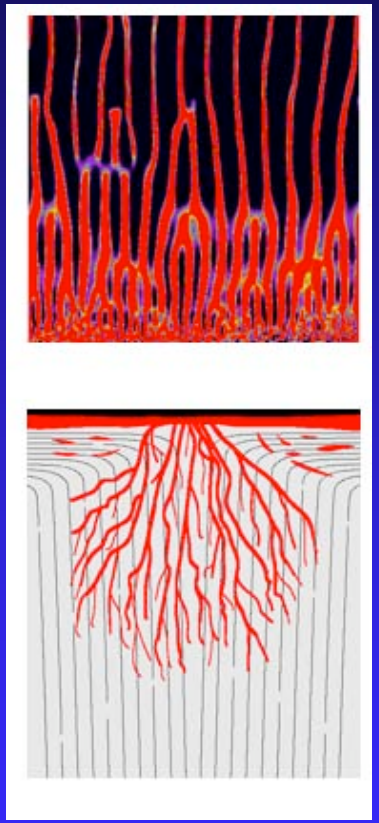
Suzanne Carbotte[1], Helene Carton[1], Milena Marjanovic, Shuoshuo Han, Vicki Ferrini[1], Pablo Canales[2], Mike Perfit[3], John Mutter[1], Mladen Nedimovic[1], [1]LDEO, [2]WHOI, [3]UFlorida

# Mantle melting



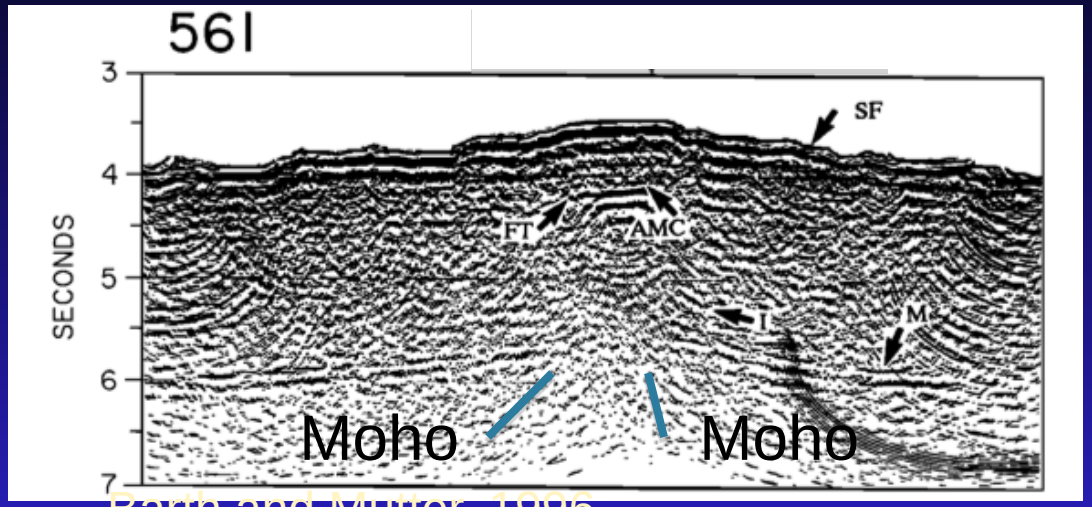

*MELT science team, Science, 1998*

# Melt migration



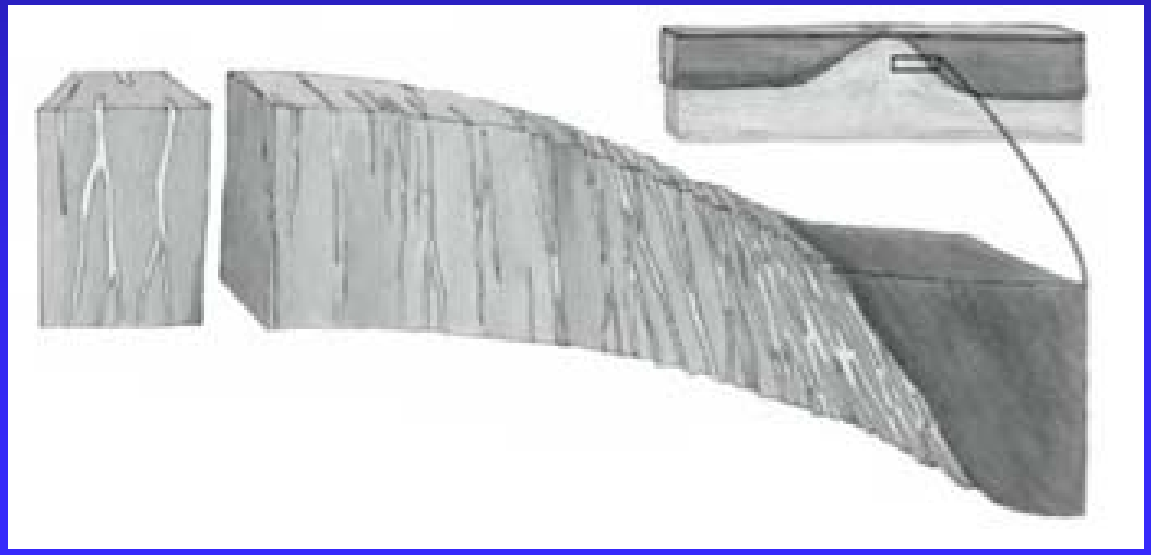
Kelemen et al., 1995
Spiegelman et al., 2000

Crust fully formed at axis requires focused mantle melt delivery



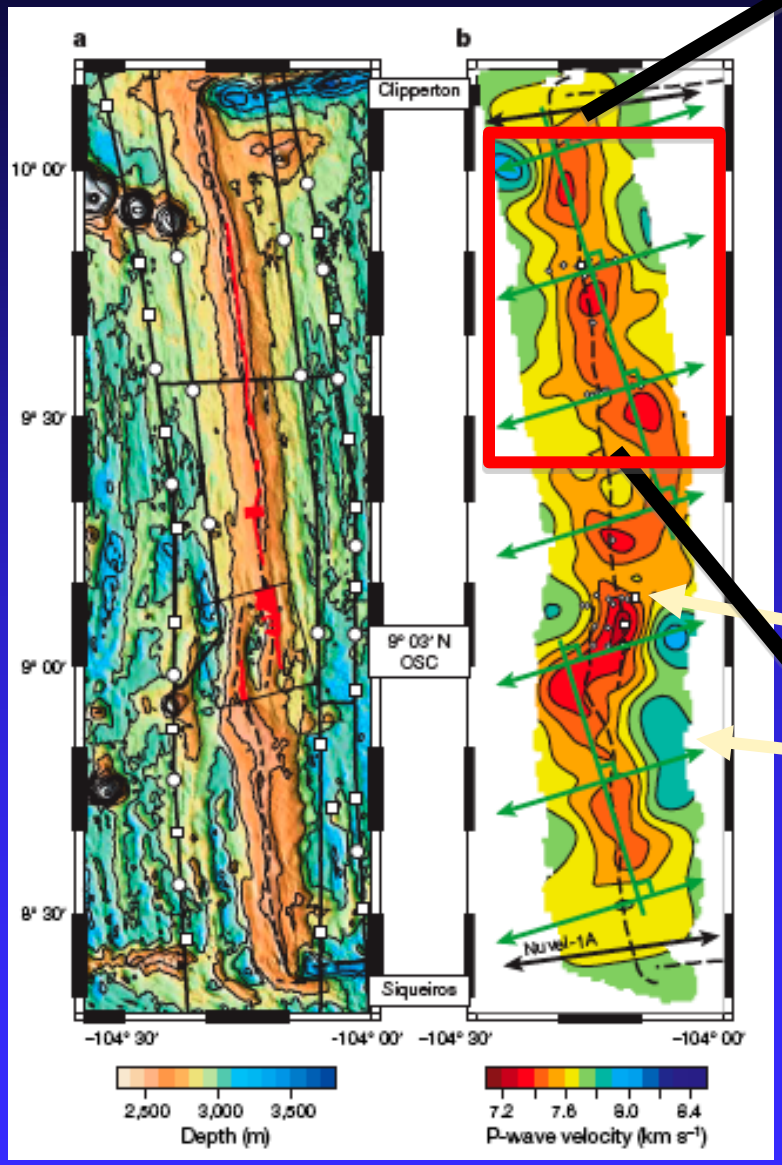

Barth and Mutter, 1996

Melt focusing via channels at LAB (e.g.Sparks and Parmentier, 1991)

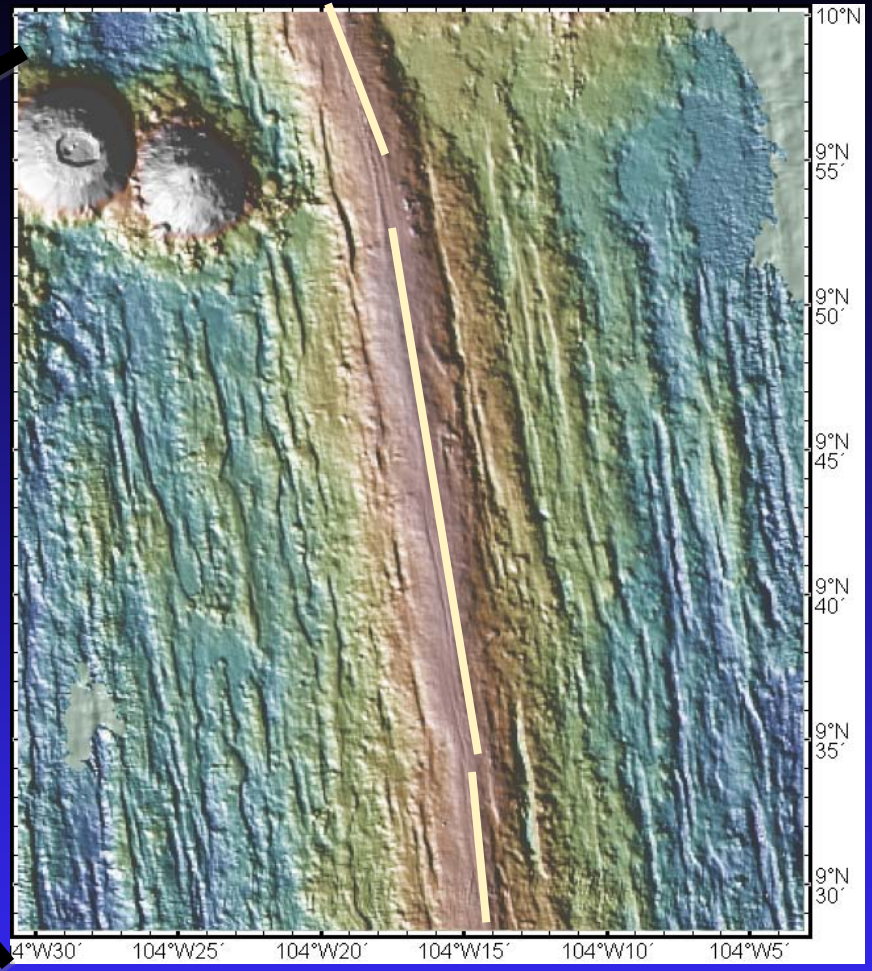


Holtzman et al., 2005

# Uppermost Mantle Melt

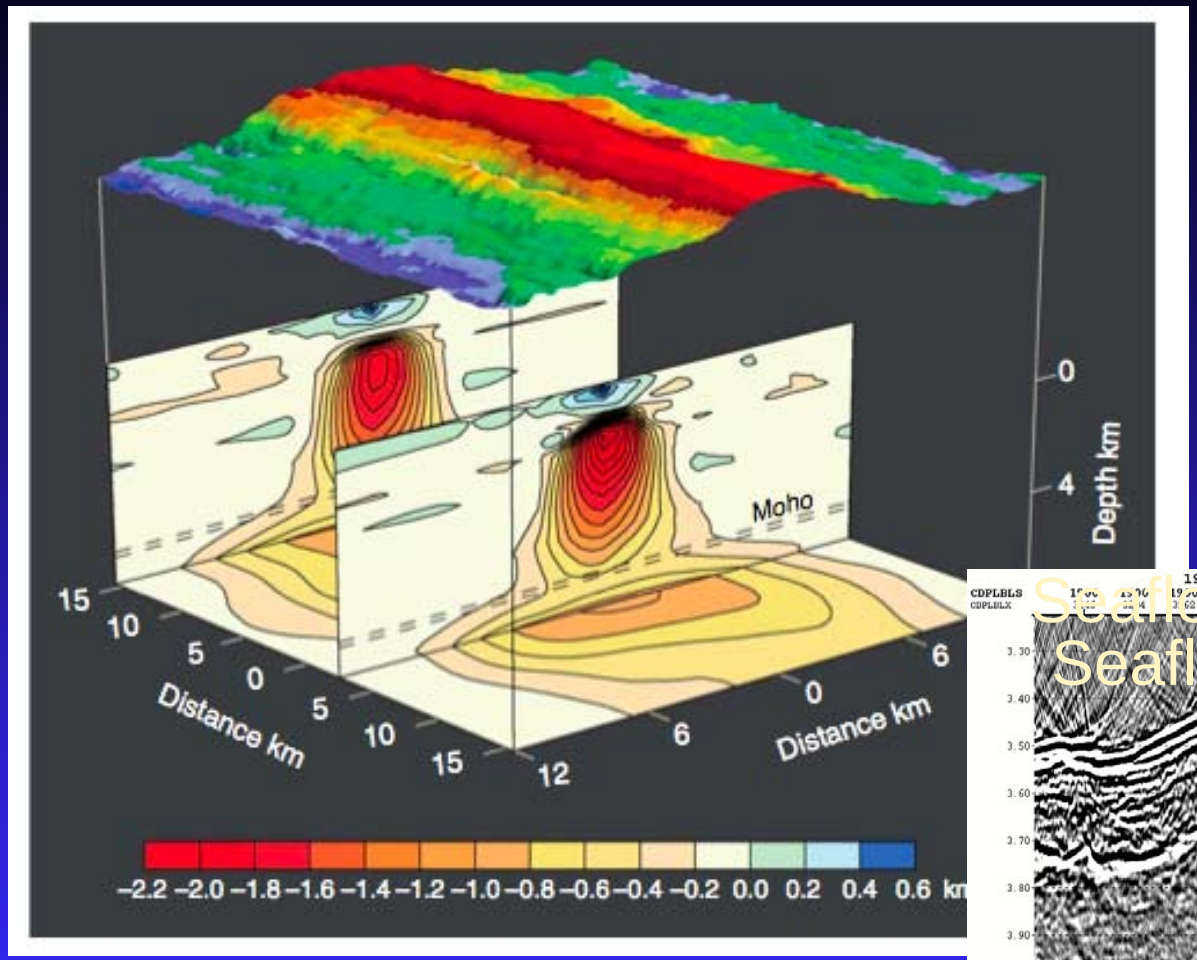



Toomey et al., 2007

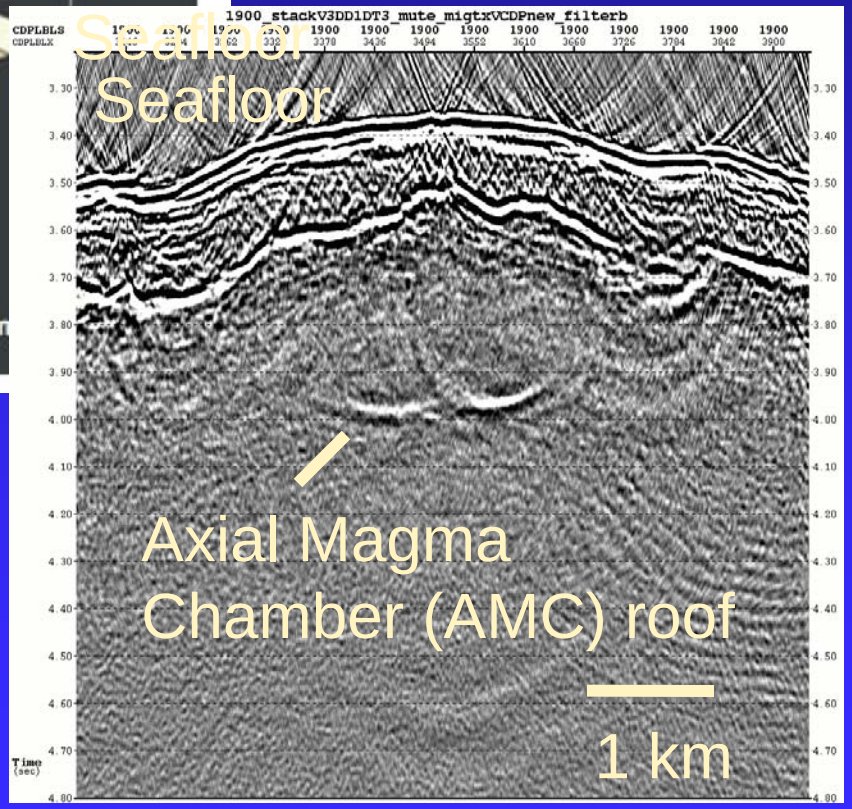



- Segmentation of mantle melt at base of crust spaced ~30 km
- Persists – $10^5$ to $10^6$ yrs

# Melt distribution in the crust

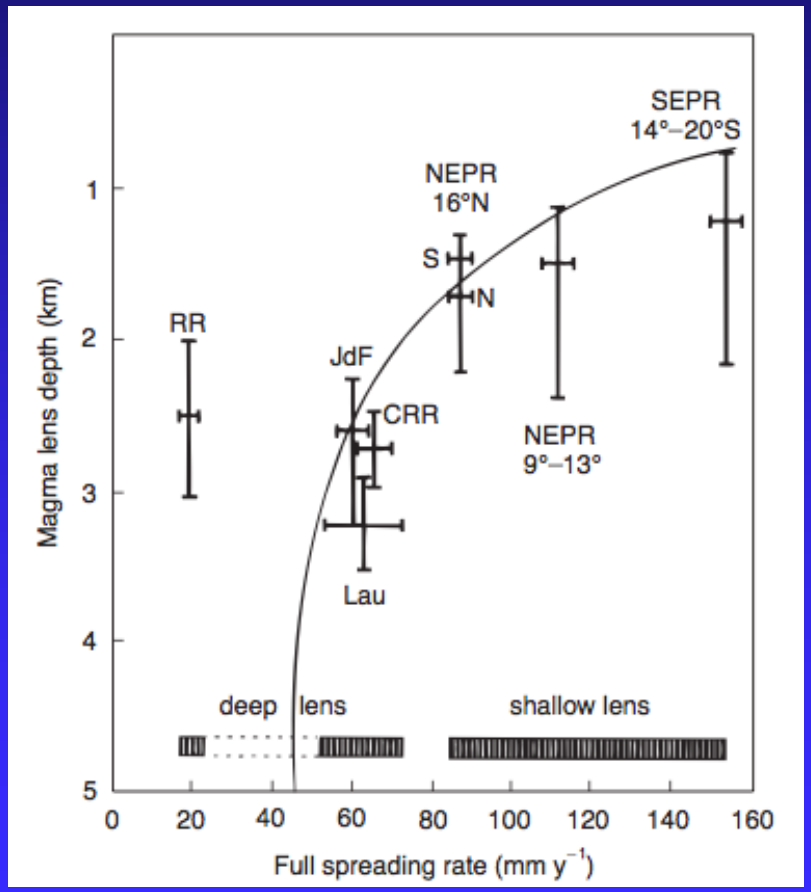



Dunn et al., 2000

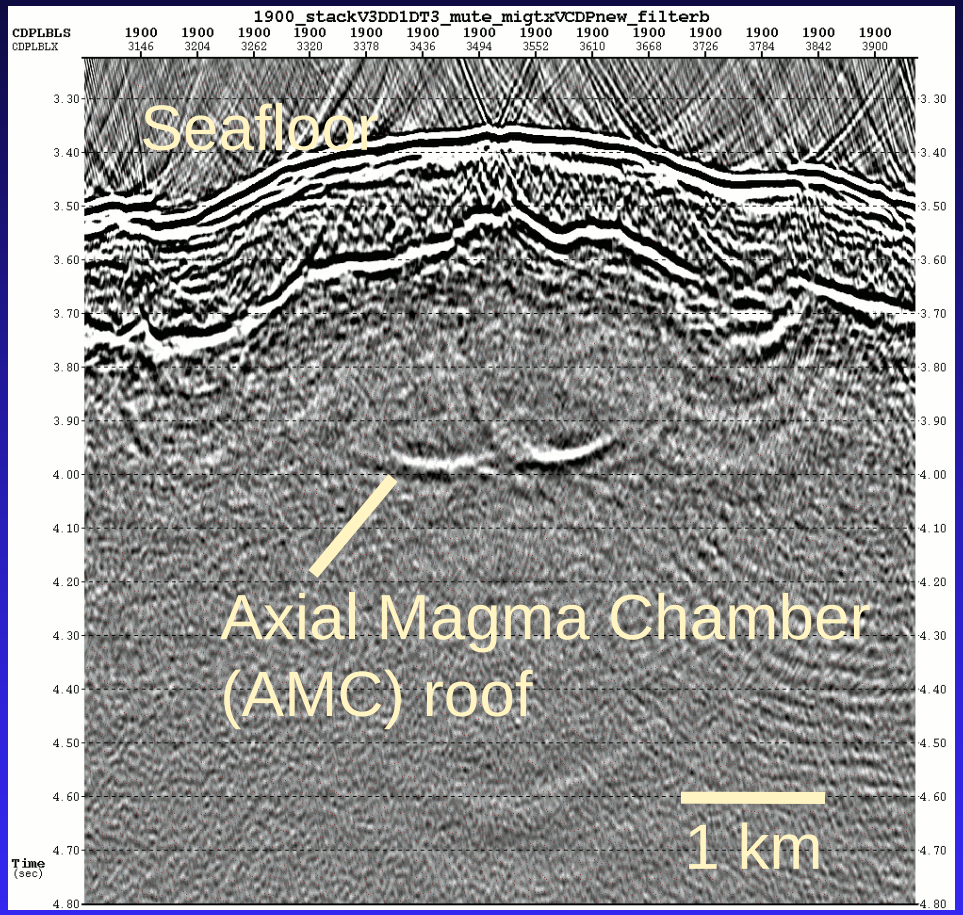


# Axial magma lens

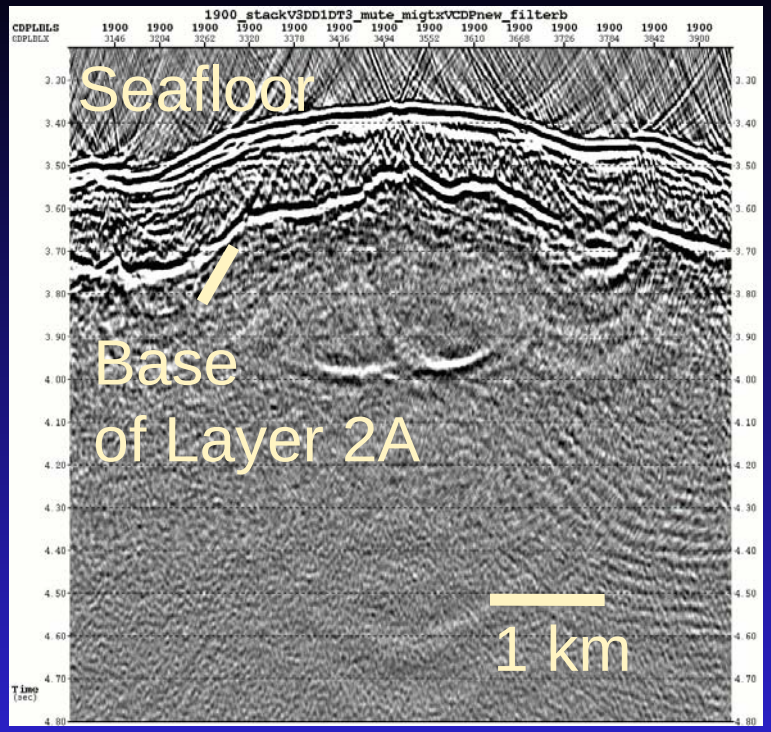
- 10's of kilometers
- ~500m-4.5 km wide,
- 10's of meters thick

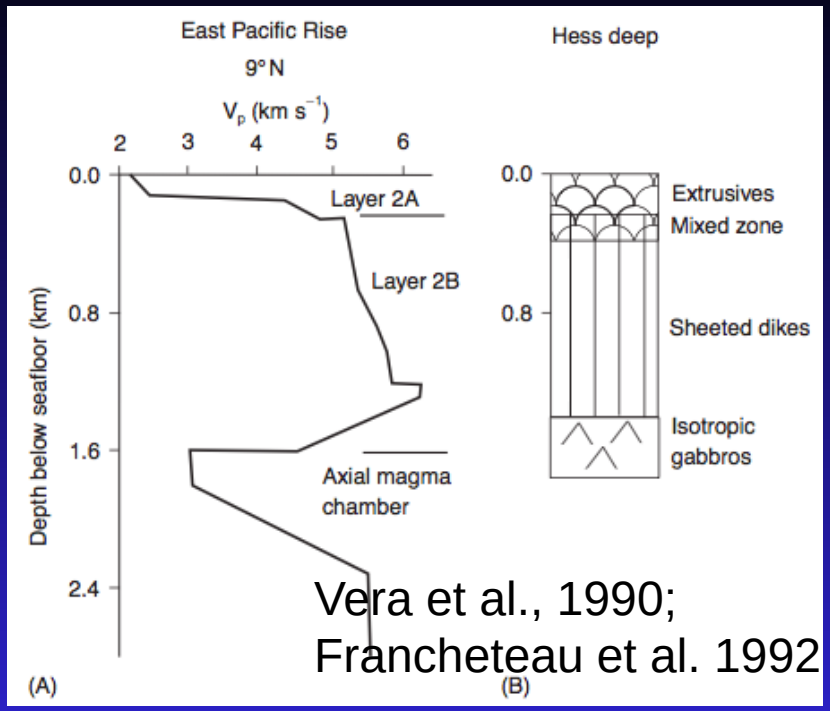



Modified from Purdy et al., 1991

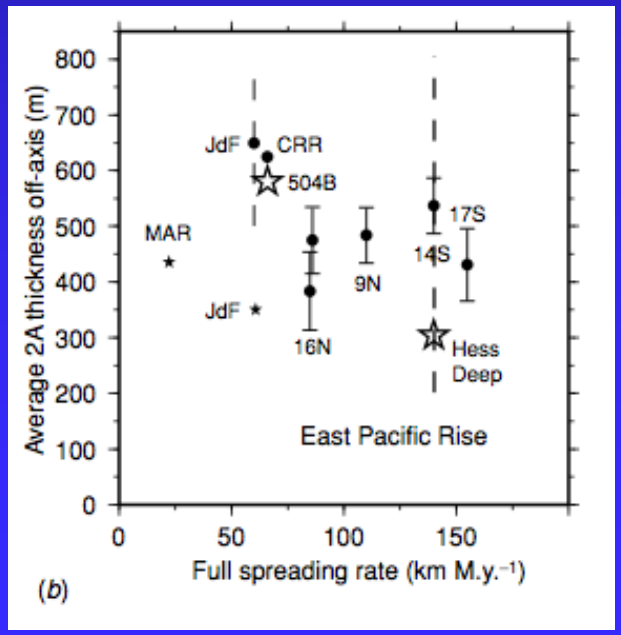



- Variations in depth with spreading rate (magma supply) 1.2 to >4 km depth



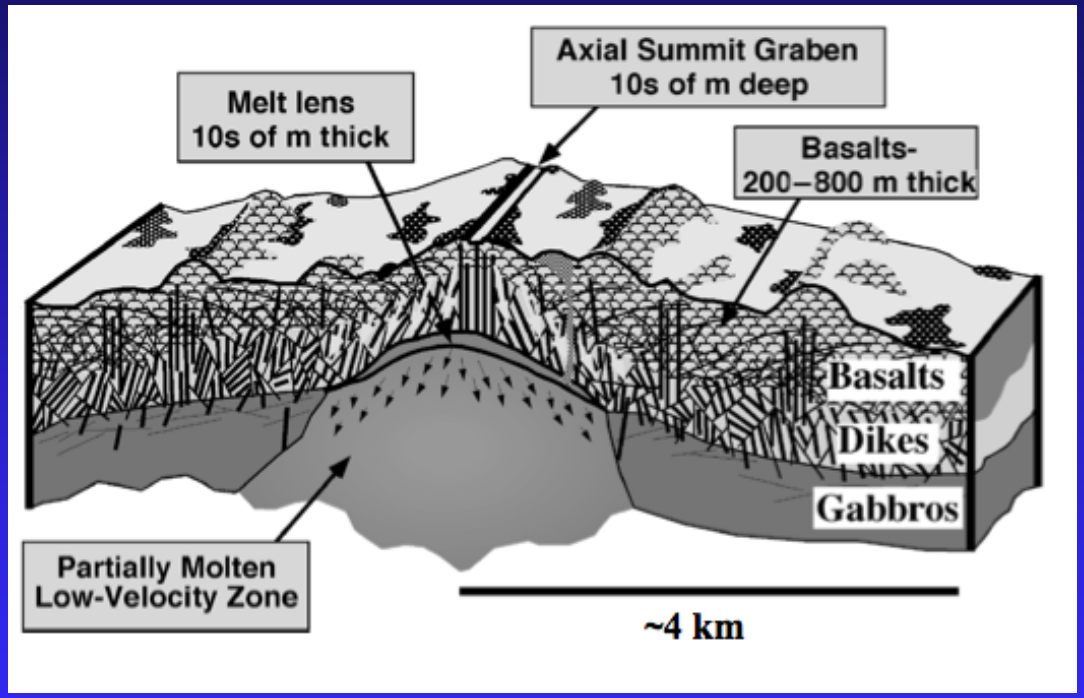




Vera et al., 1990;
Francheteau et al. 1992




# Upper Crust

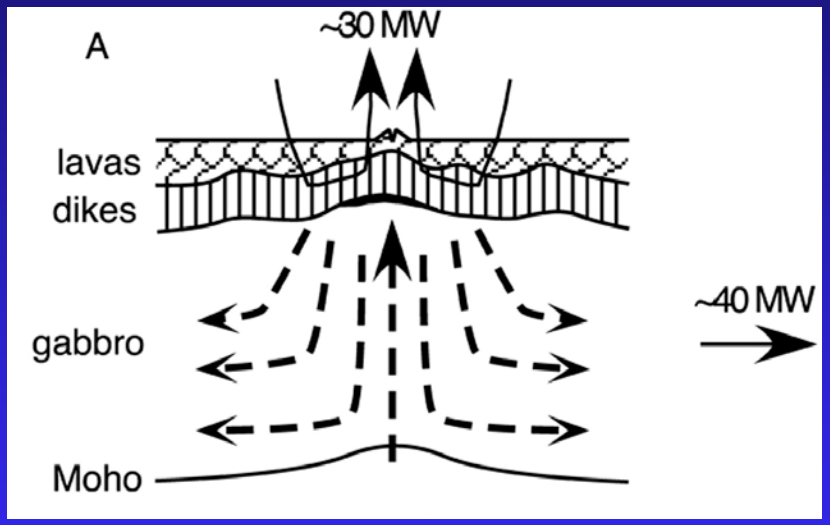
# Formation of the Upper Crust




Karson et al., 2002

# Formation of the lower crust

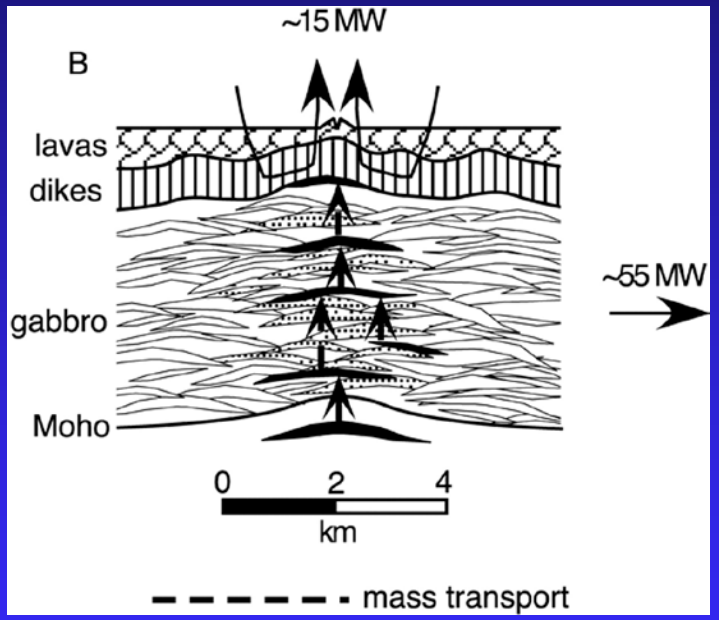
Gabbro glacier




Phipps Morgan and Chen 1993; Henstock et al., 1993

Seismic Observations

Sheeted sills




Kelemen et al., 1995

Ophiolite Observations

# Current research

- How do MOR magmatic systems evolve and on what time scales?
- How long do mid-crustal magma sills persist? Frequency and processes of replenishment?
- What triggers volcanic eruptions? Mantle melt injection events? Tectonic stress?
- Dynamics of dike propagation.
- Are magma sills present in lower crust on-axis?