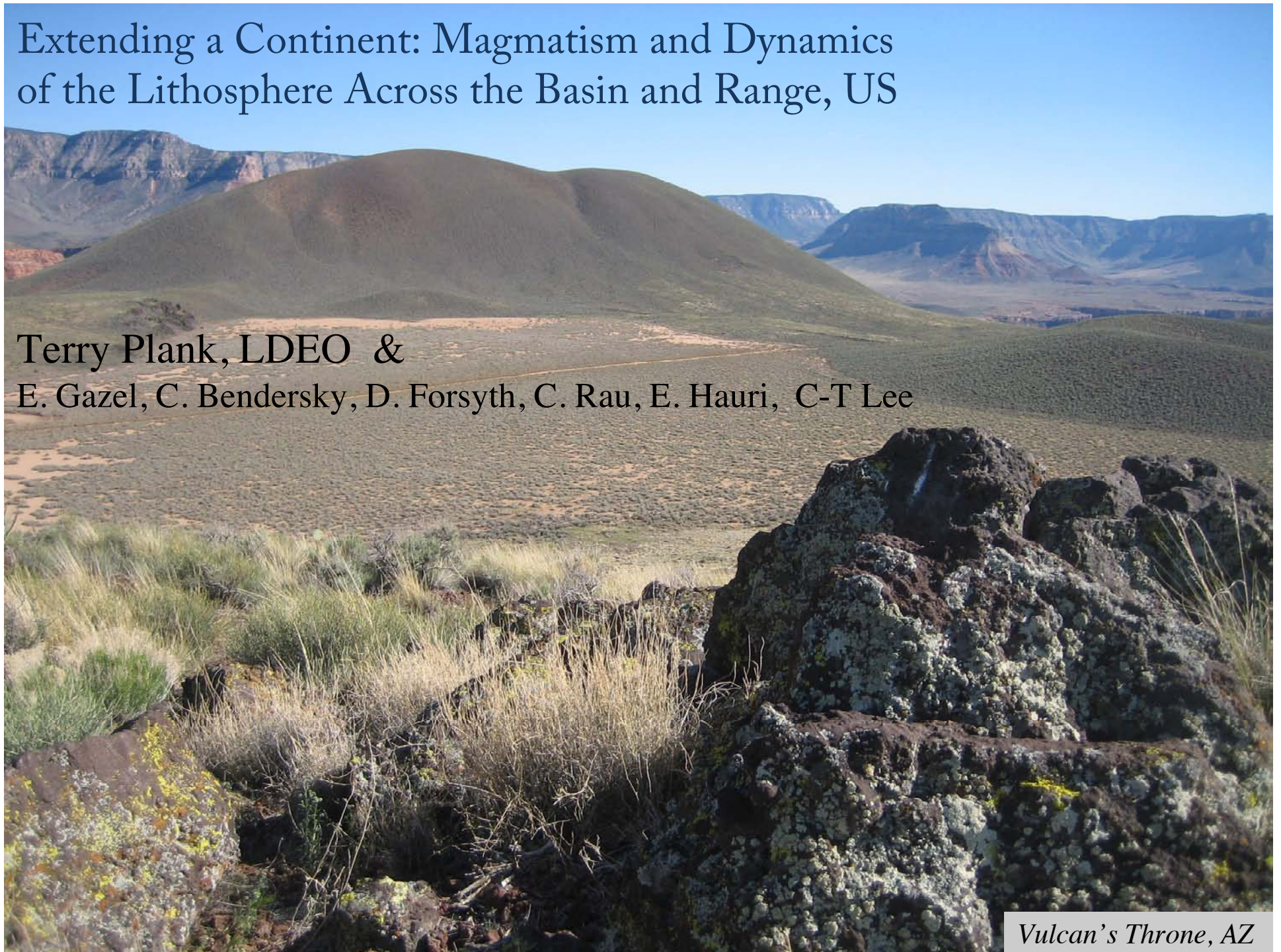


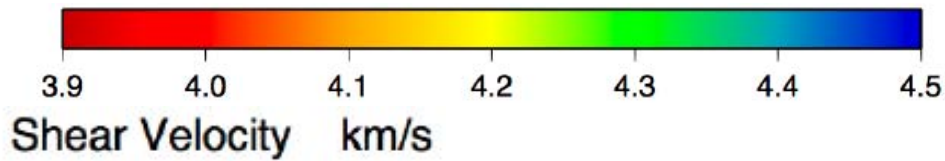
Extending a Continent: Magmatism and Dynamics of the Lithosphere Across the Basin and Range, US

Terry Plank, LDEO &

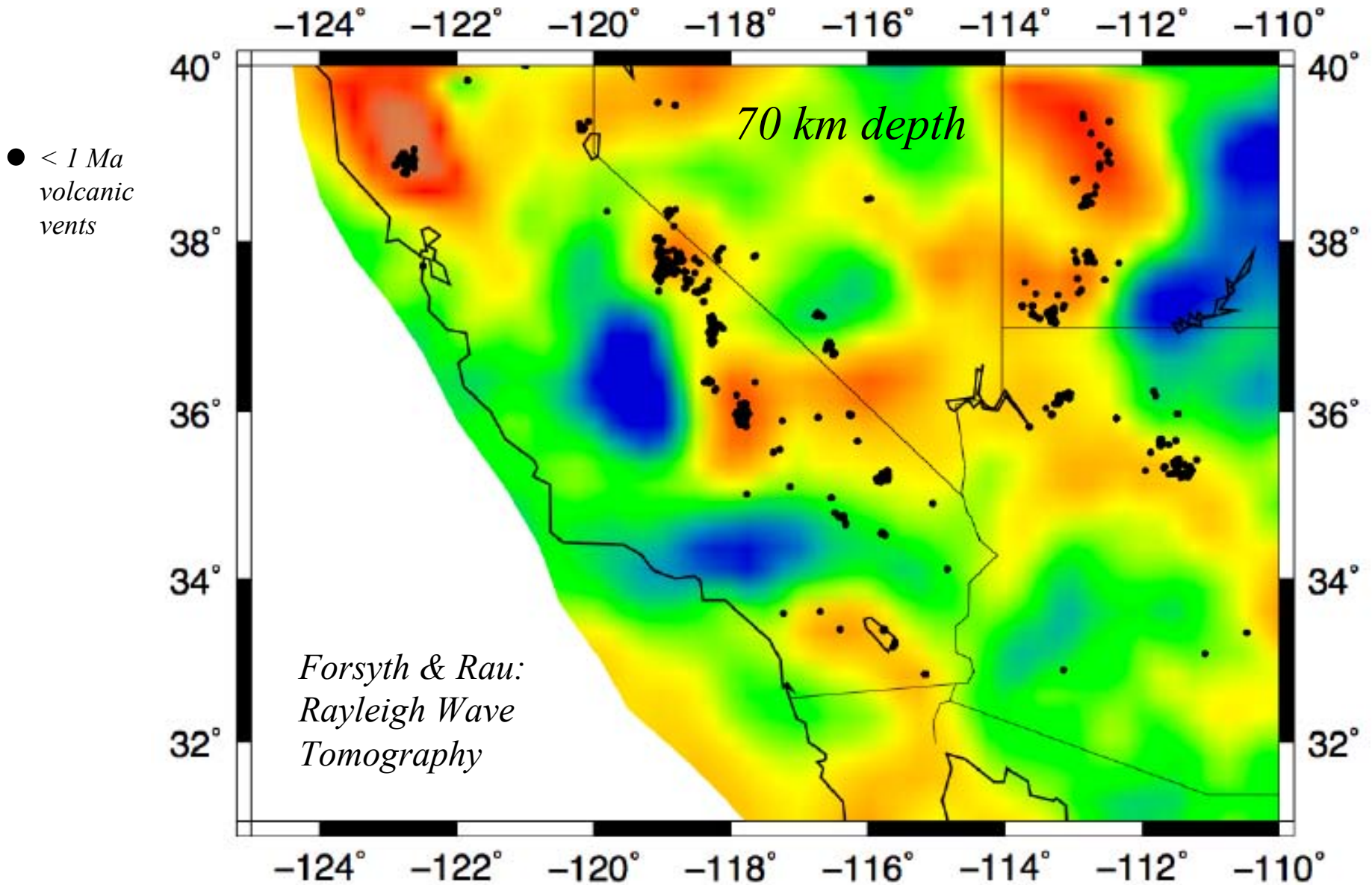
E. Gazel, C. Bendersky, D. Forsyth, C. Rau, E. Hauri, C-T Lee



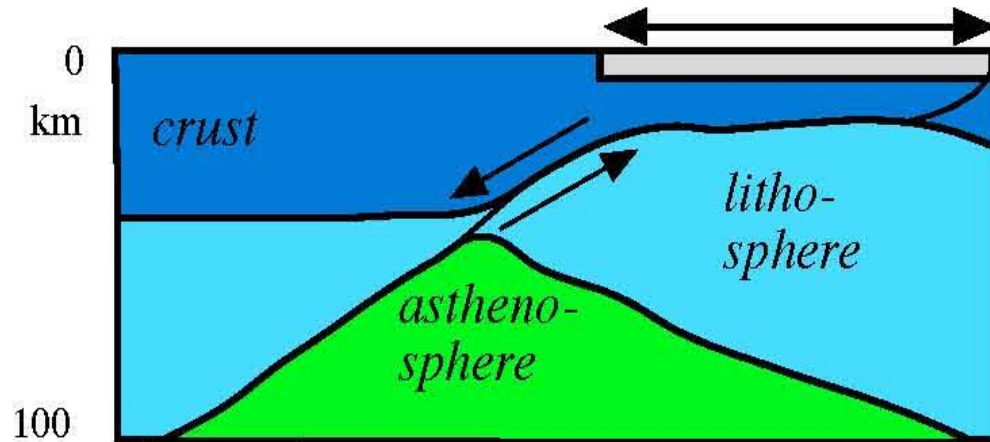
Vulcan's Throne, AZ



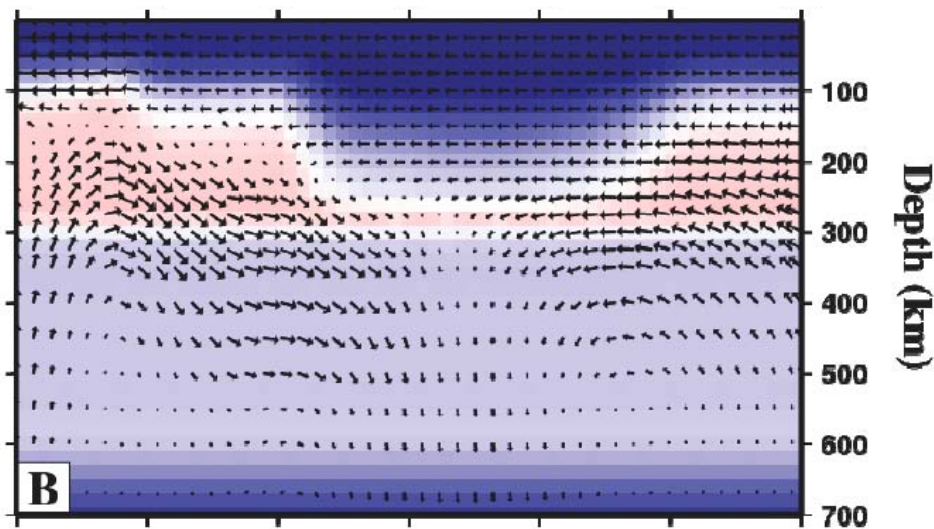
US Array:
Transportable Array



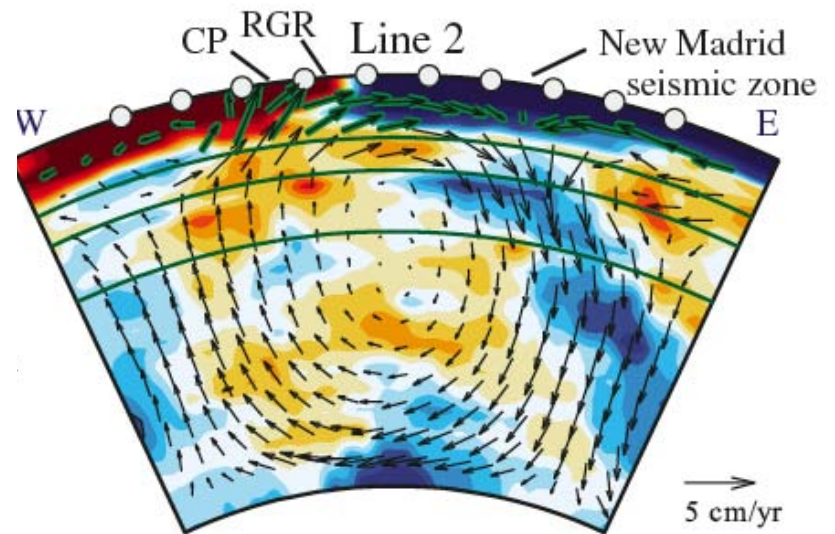
What Drives Melting Beneath the Basin and Range?



After DePaolo & Daley (2000)

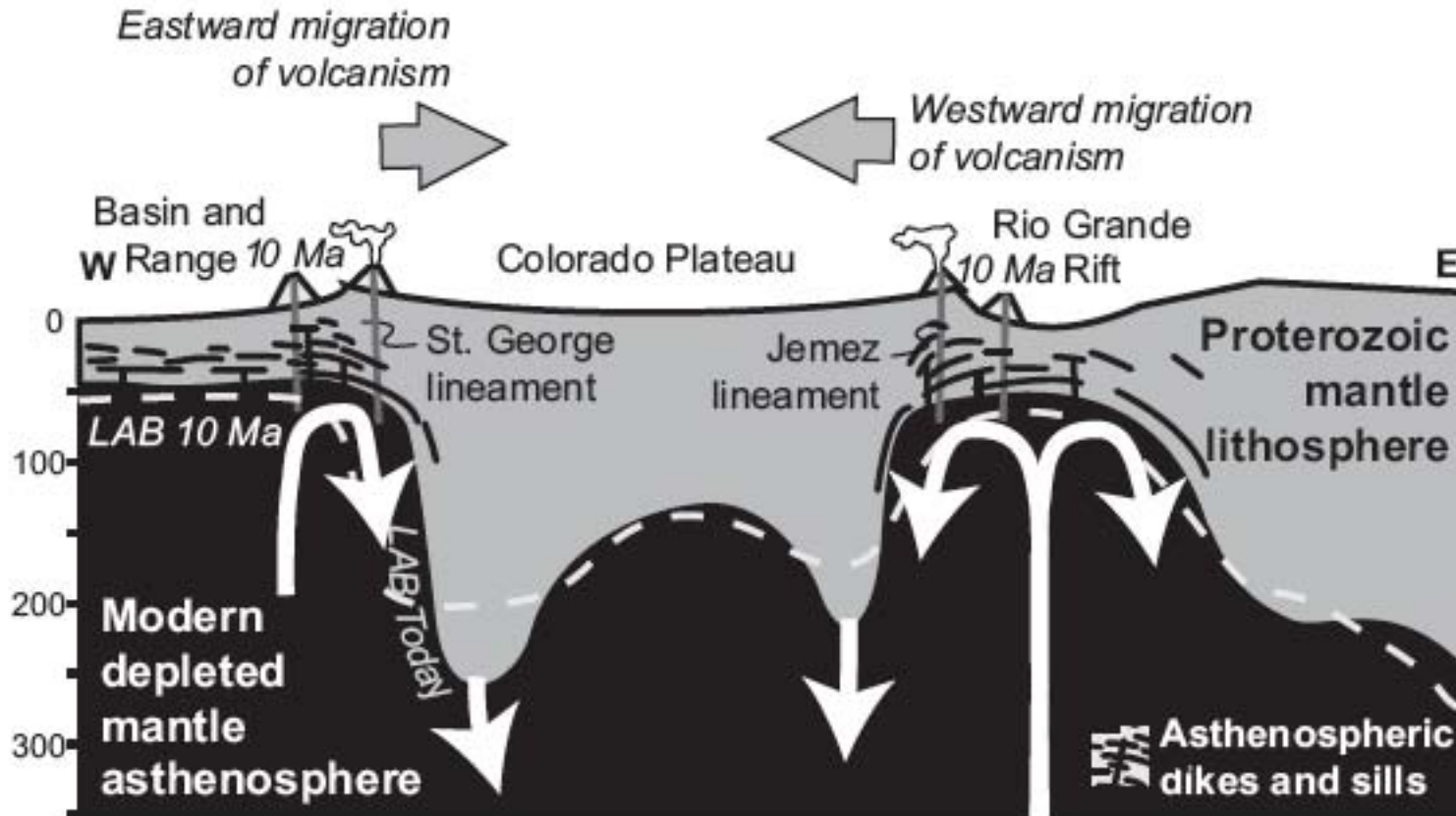


Conrad et al. (2010)



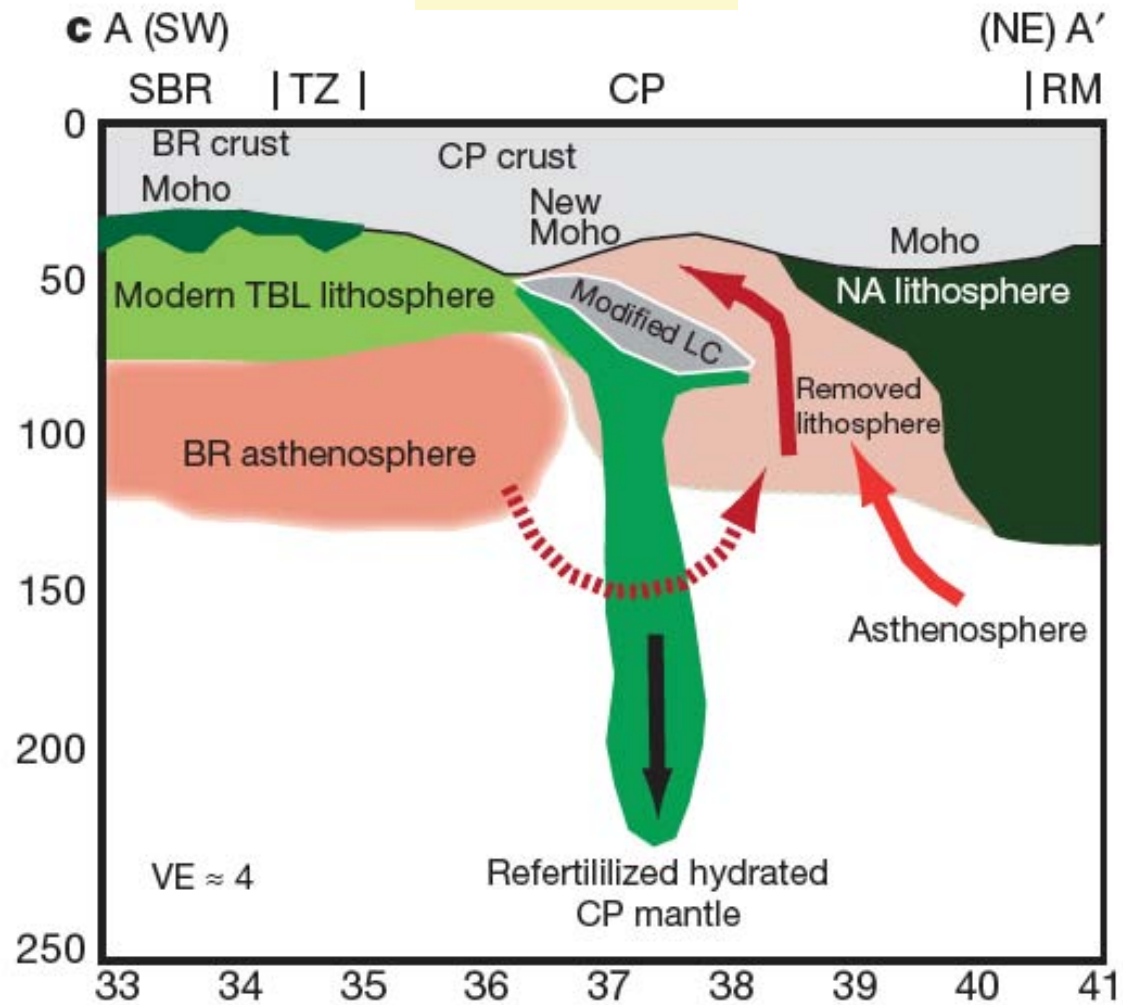
Moucha et al. (2008)

Drips:

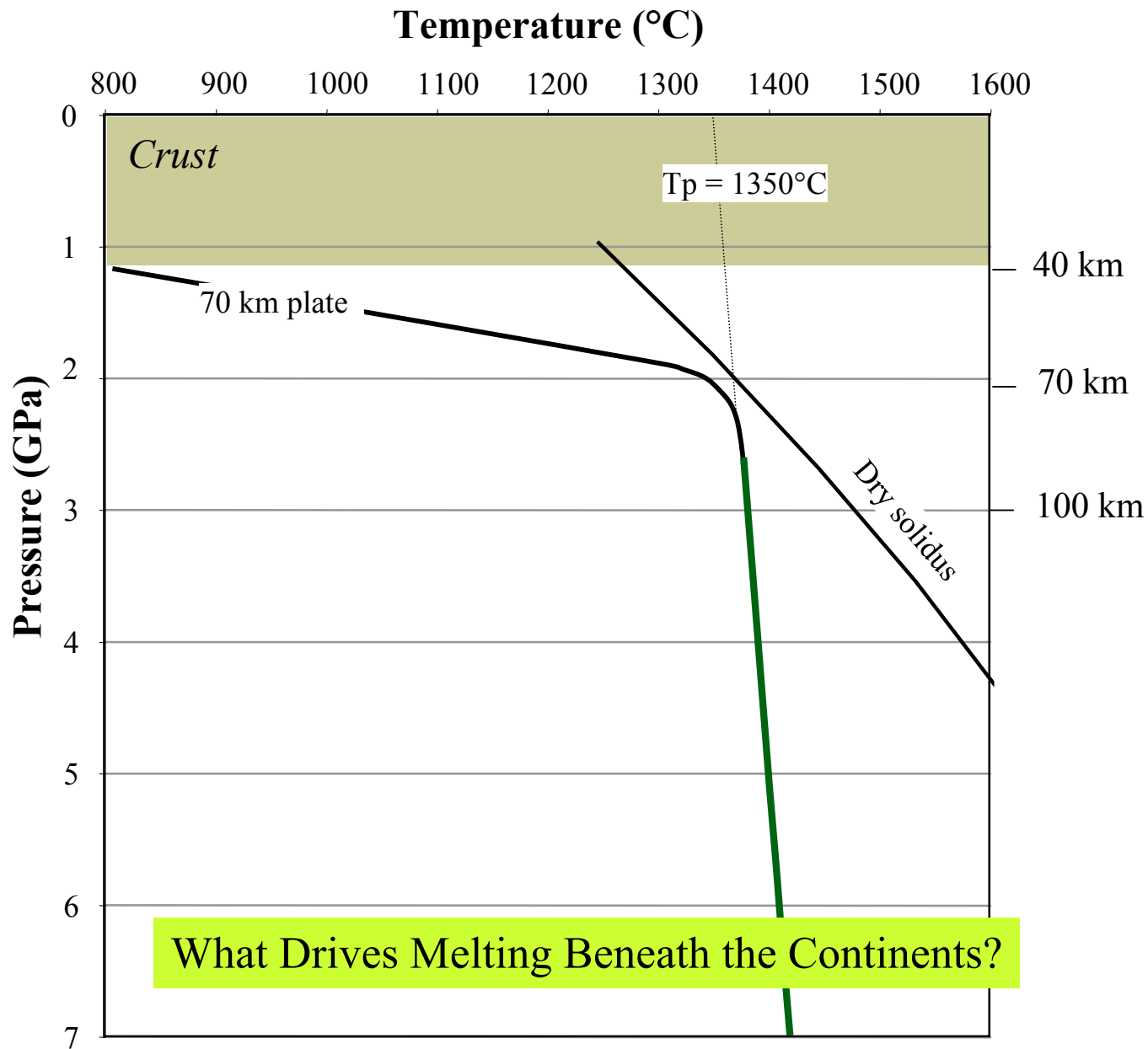


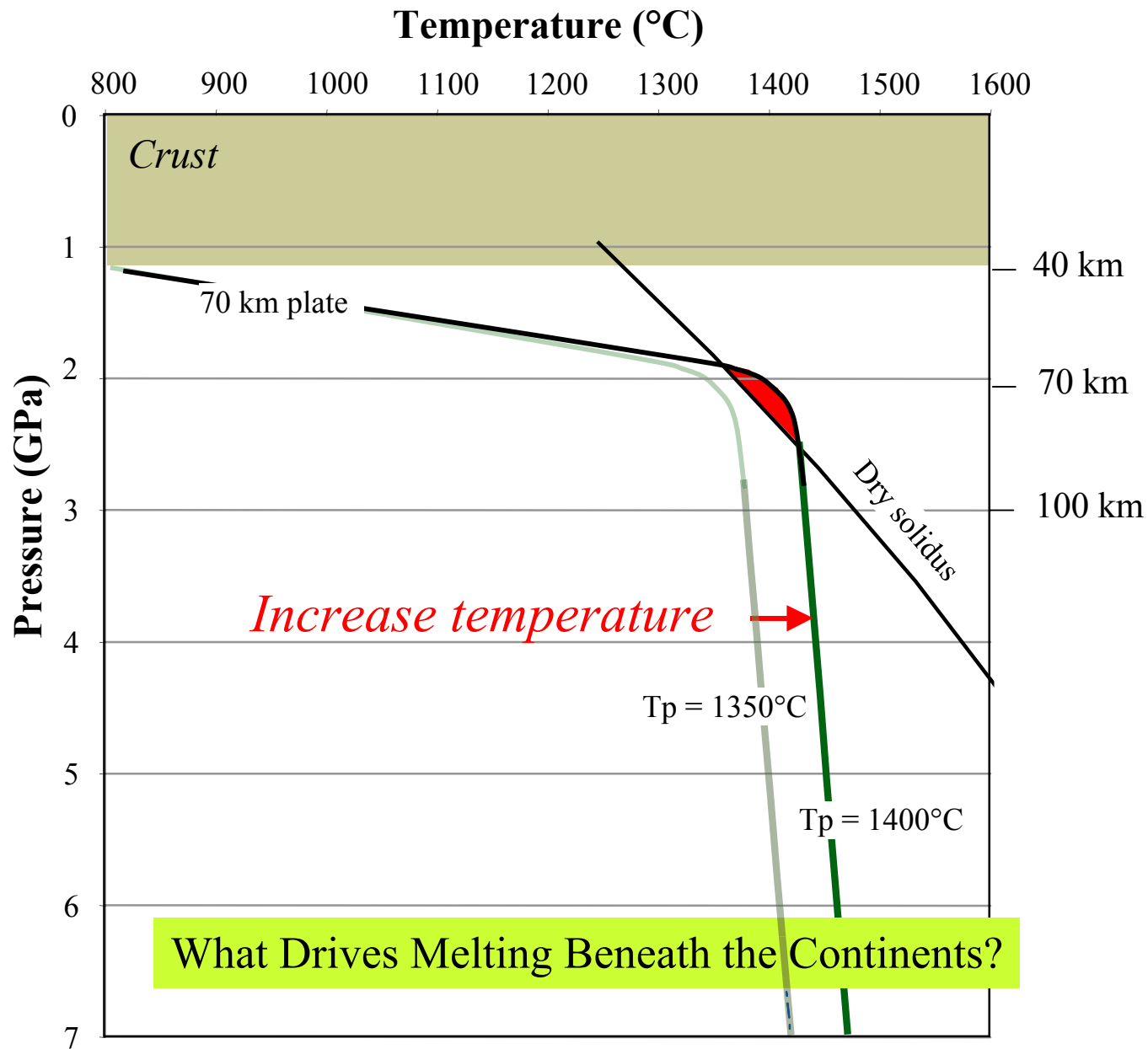
Crow, Karlstrom, Asmerom, Schmandt, Polyak and DuFrane: Geology, 2011

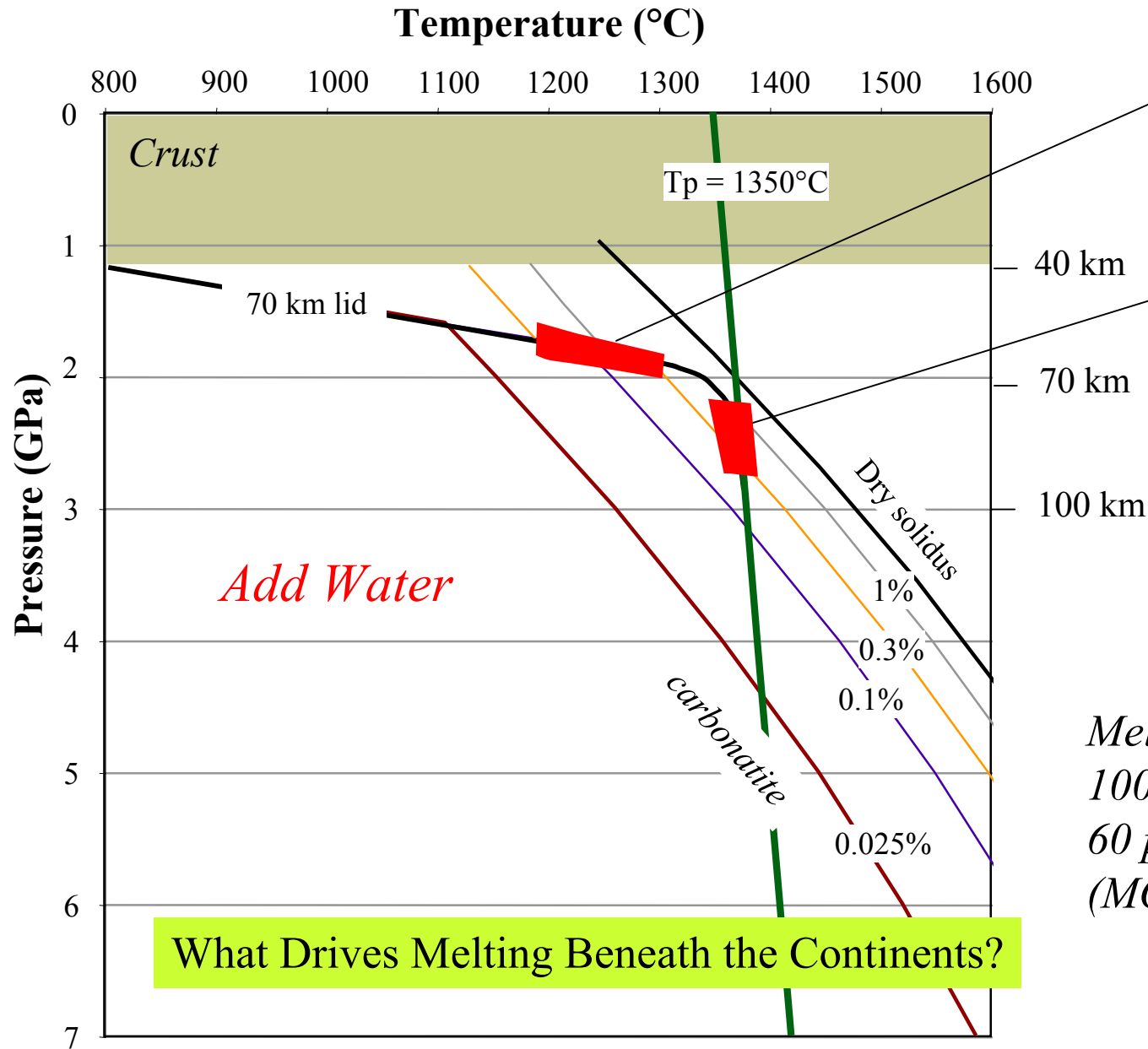
Droops:



Levander, Schmandt, Miller, Liu, Karlstrom, Crow, Lee, Humphreys: Nature, 2011





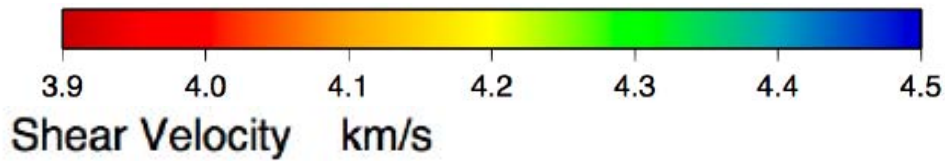


cool melts from wet lithosphere?

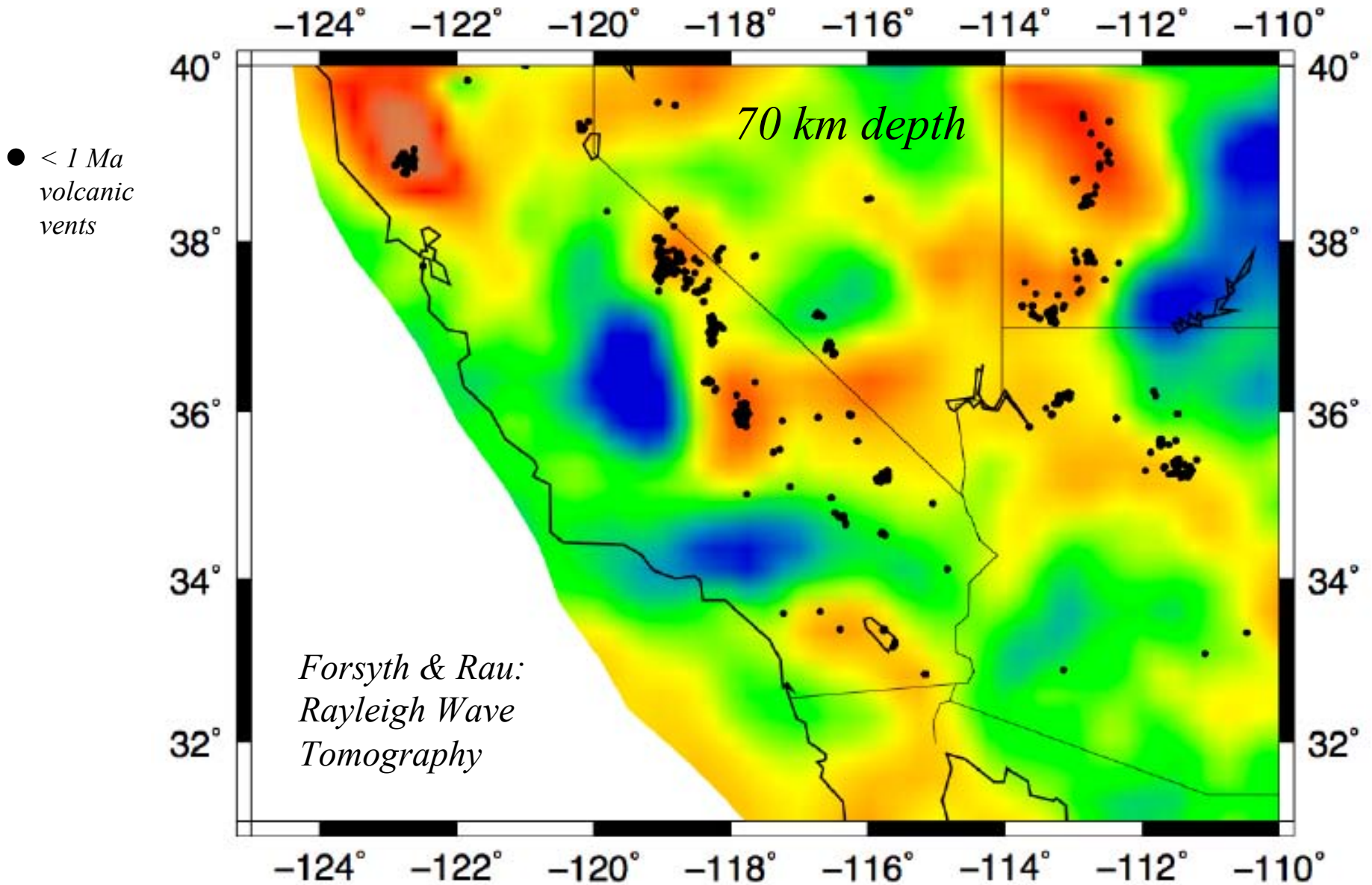
low degree melts below the LAB ?

*Melting with
100 ppm H₂O
60 ppm CO₂
(MORB source)*

What Drives Melting Beneath the Continents?

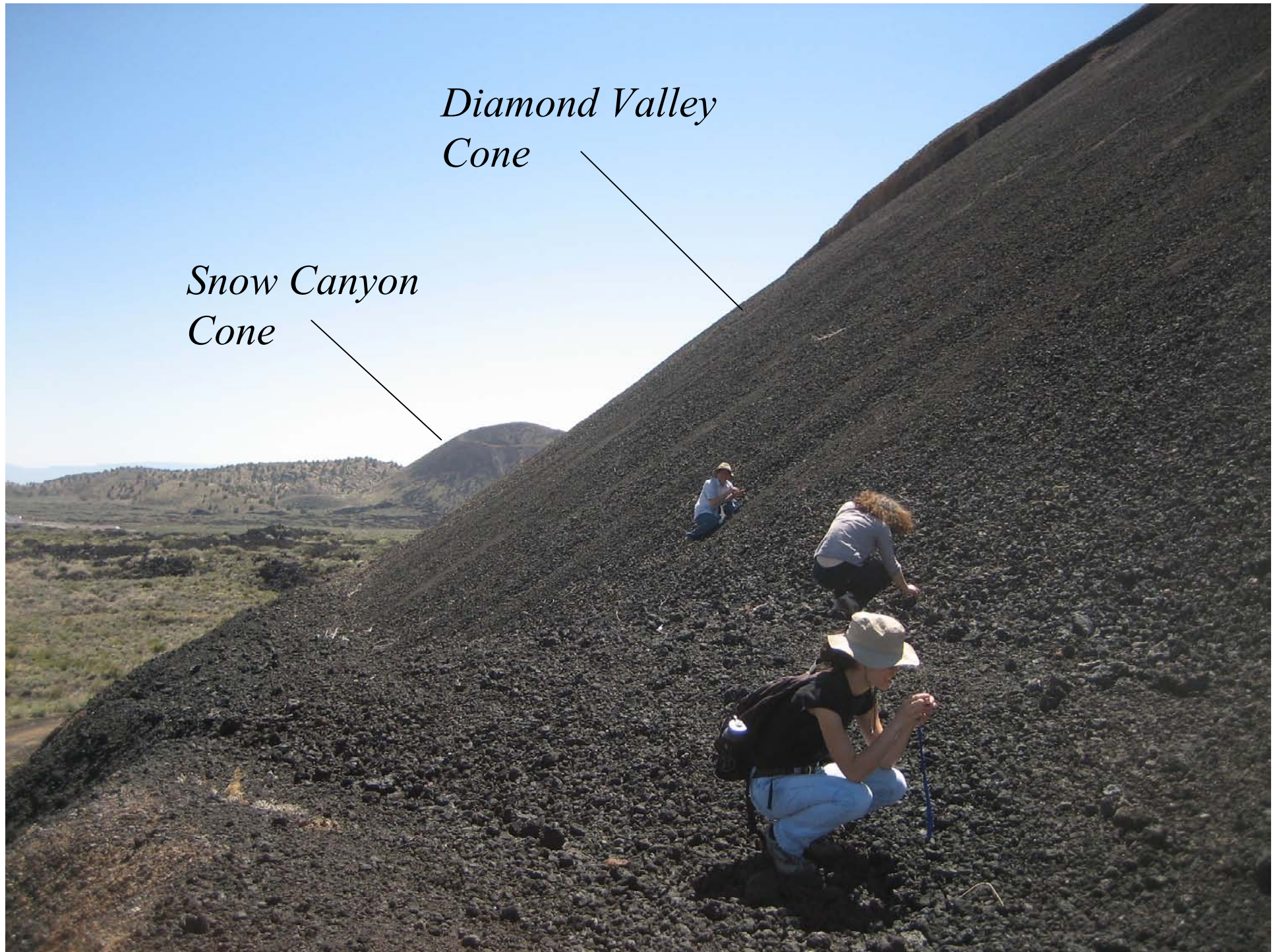


US Array:
Transportable Array

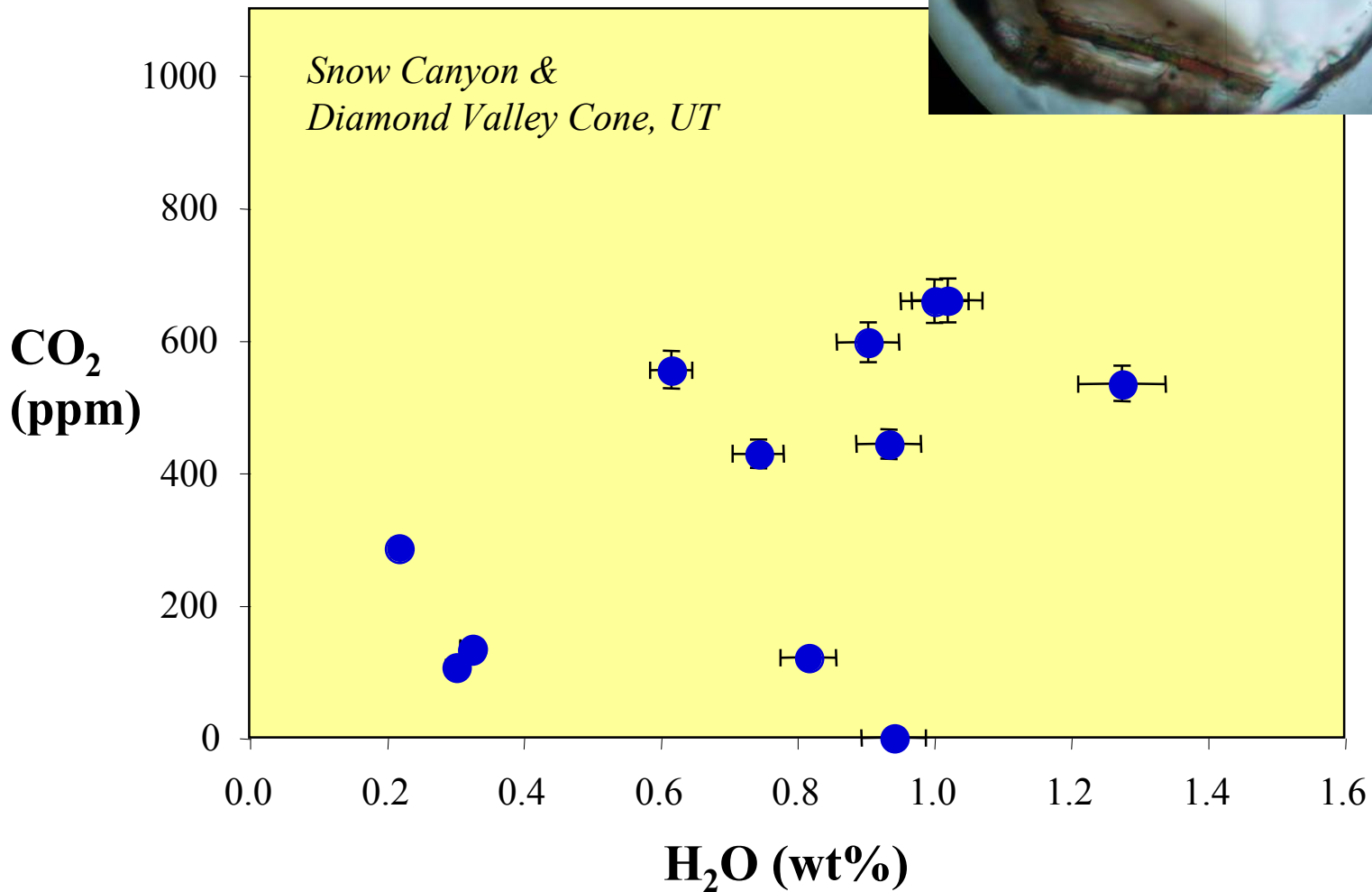
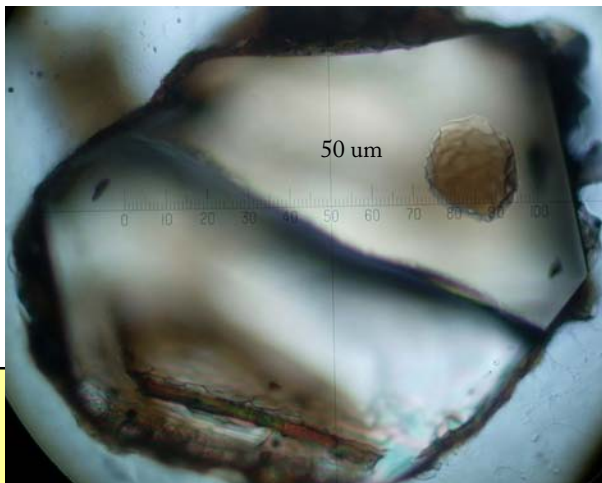


*Diamond Valley
Cone*

*Snow Canyon
Cone*



*Volatile contents of magmas
from olivine-hosted melt inclusions*

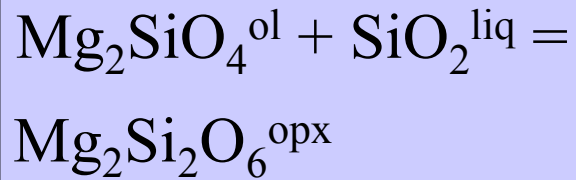


Melt Thermobarometers

$$D = \frac{\text{MgO}^{\text{ol}}}{\text{MgO}^{\text{liq}}} = f(T)$$

*olivine-melt
thermometer*

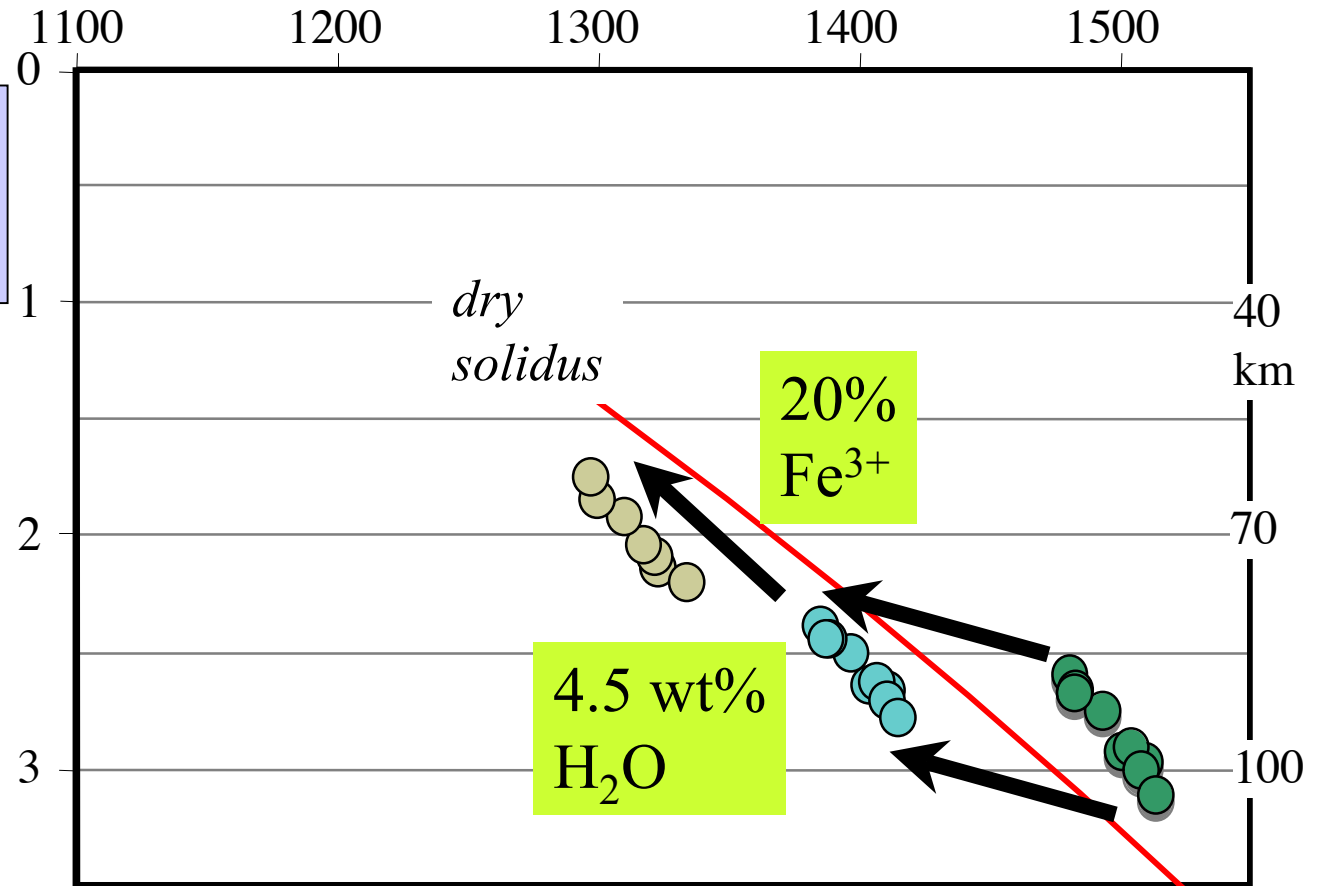
Temperature (°C)



$$a(\text{SiO}_2)^{\text{liq}} = f(P)$$

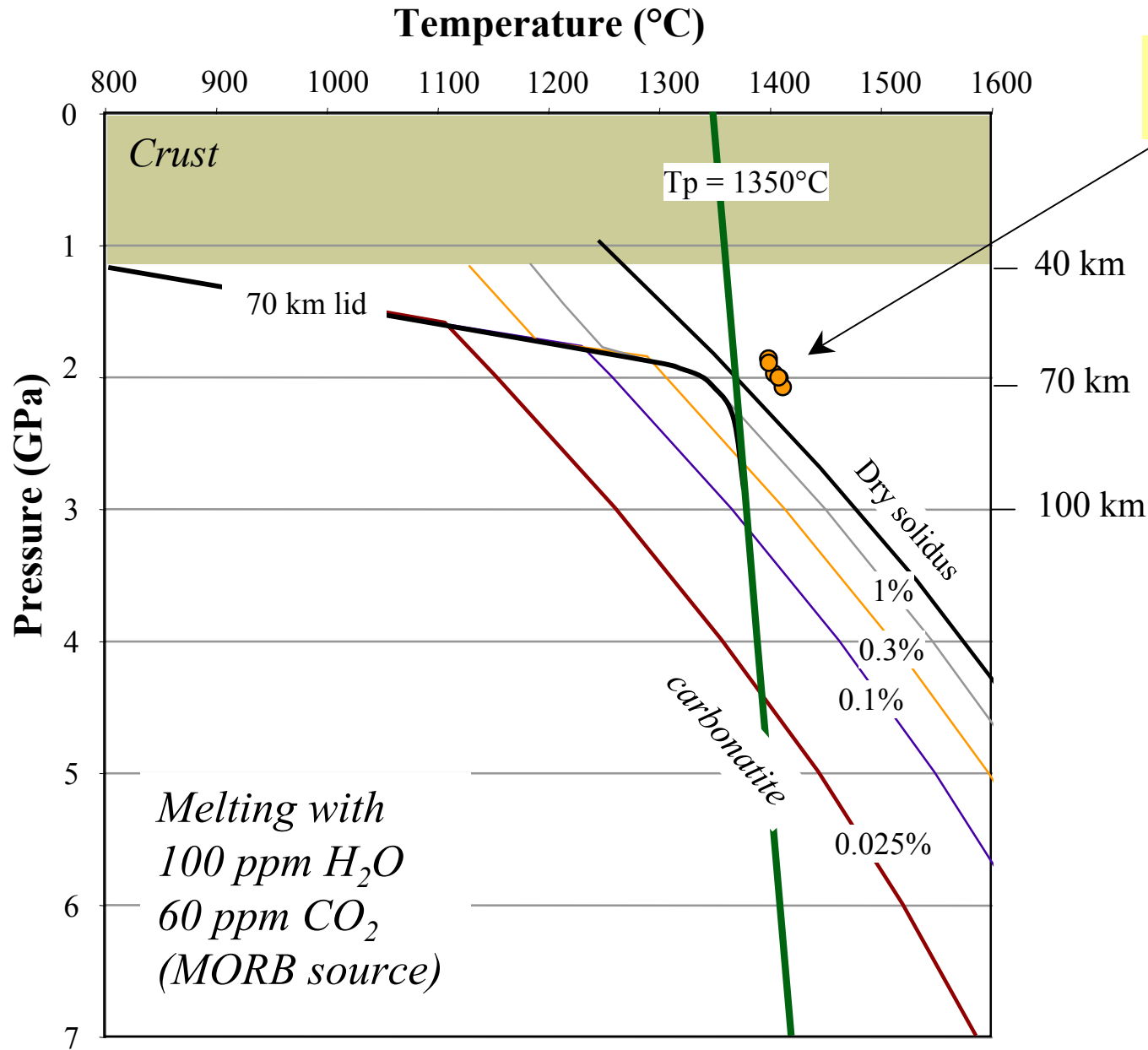
*silica-melt
barometer*

Pressure (GPa)

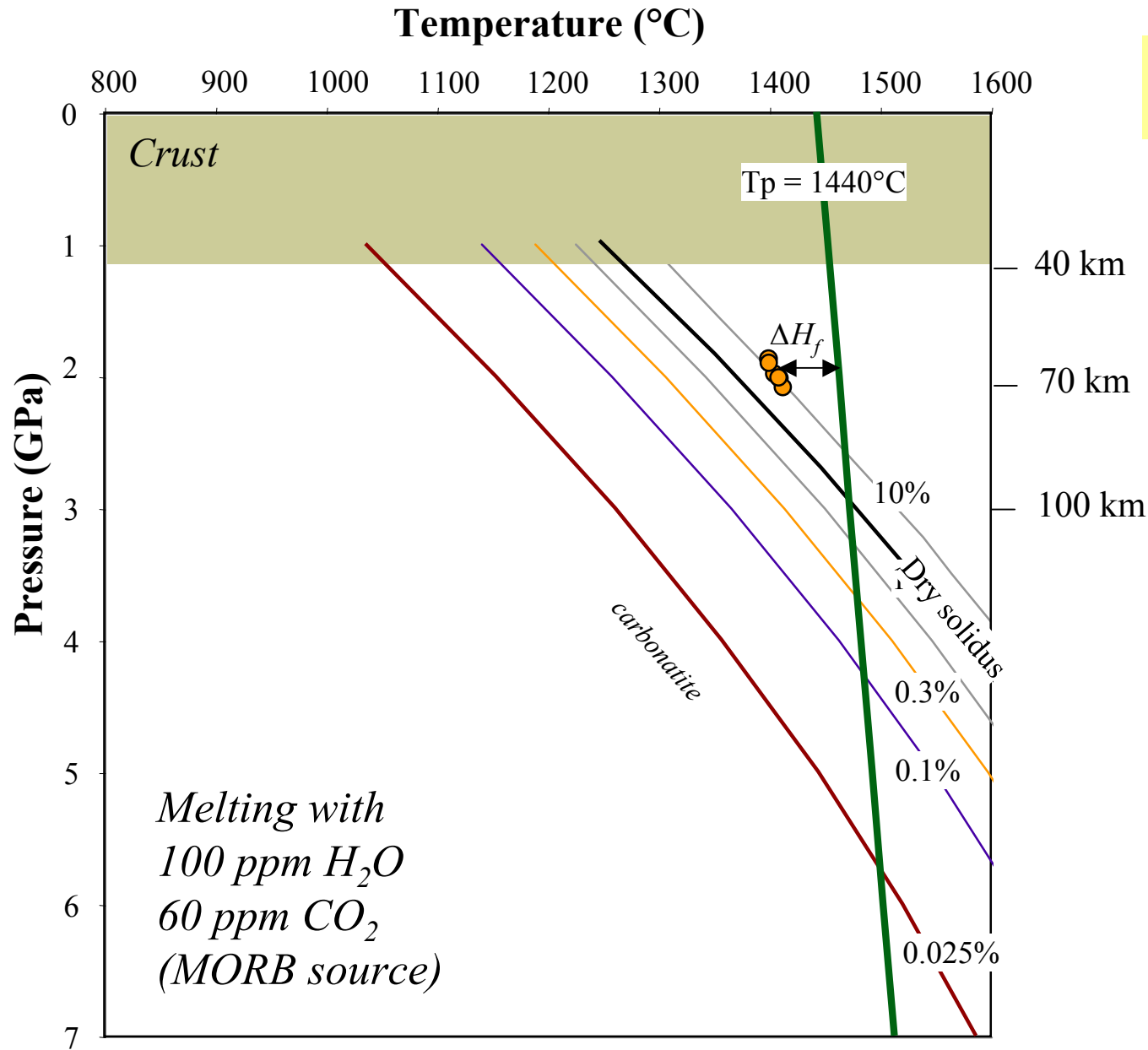


Thermobarometer parameterizations from C-T Lee et al, EPSL, 2009

Solidus from Hirschmann (2000)

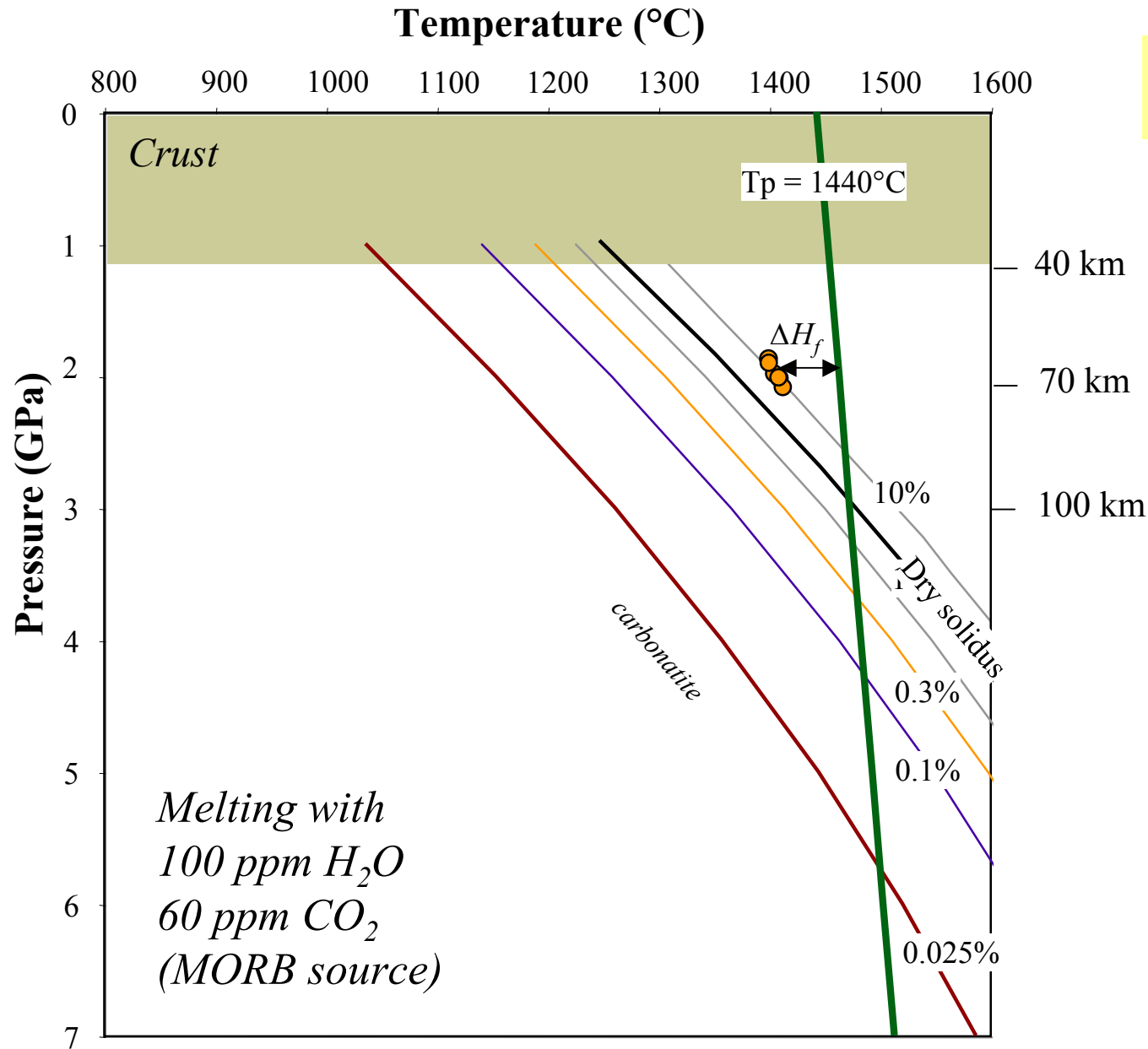


*Snow Canyon
magma equilibration*



*Snow Canyon
magma equilibration*

Mantle is Hot

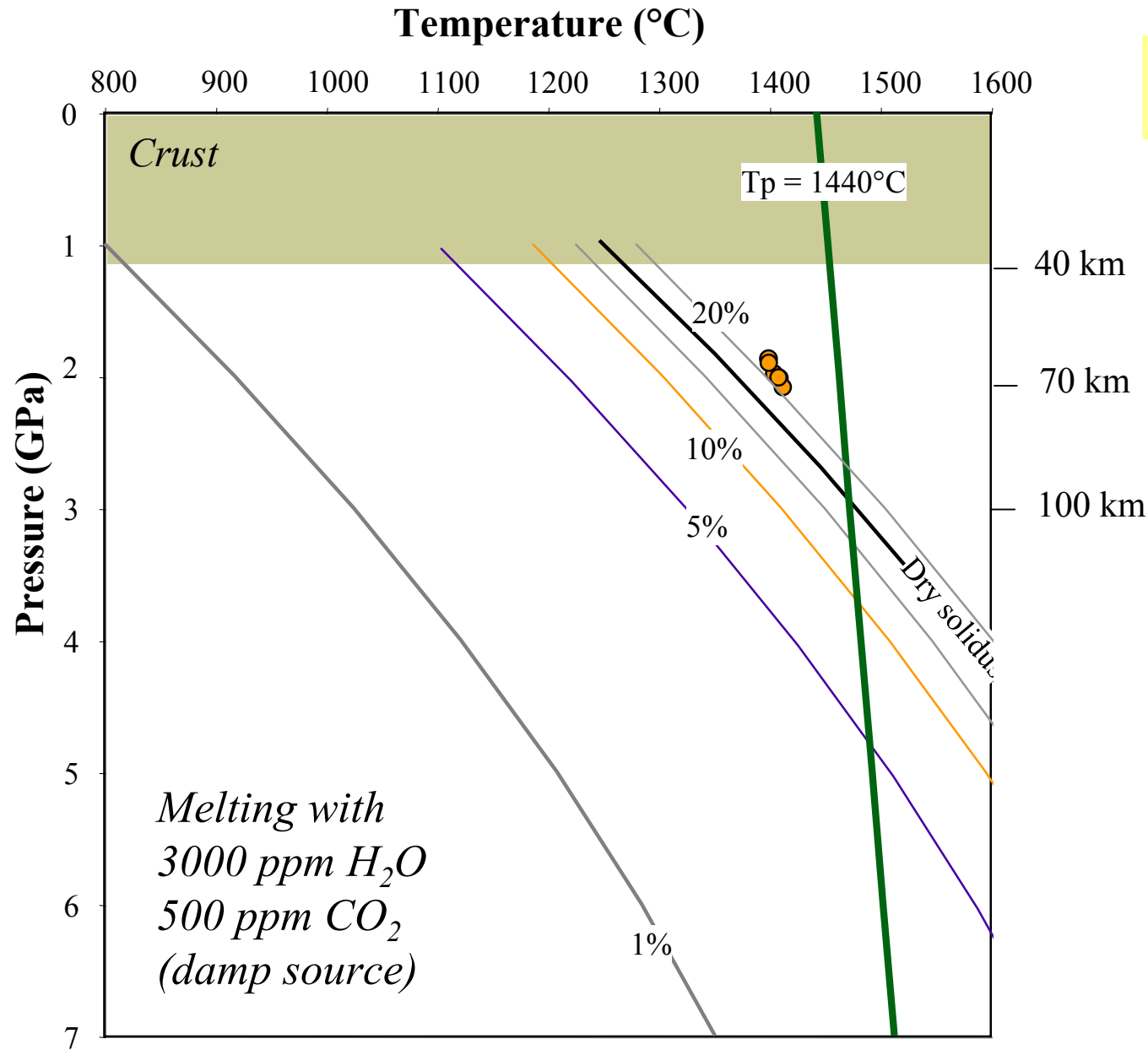


Snow Canyon
magma equilibration

Mantle is Hot

$F=10\%$
 $\text{H}_2\text{O}=0.1 \text{ wt}\%$

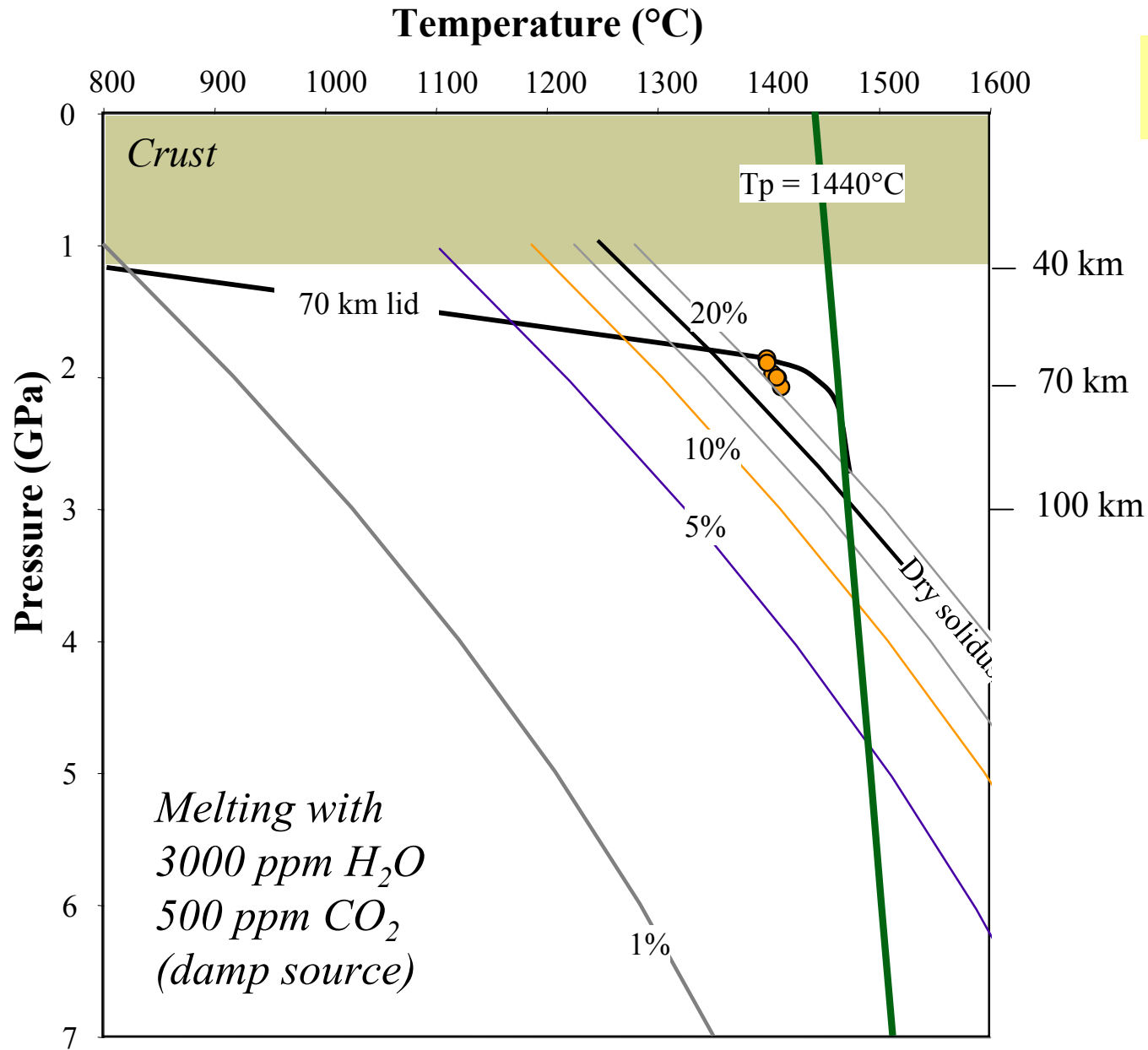
But.....
magmas
have
 $>1 \text{ wt}\% \text{H}_2\text{O}$



*Snow Canyon
magma equilibration*

Mantle is Hot

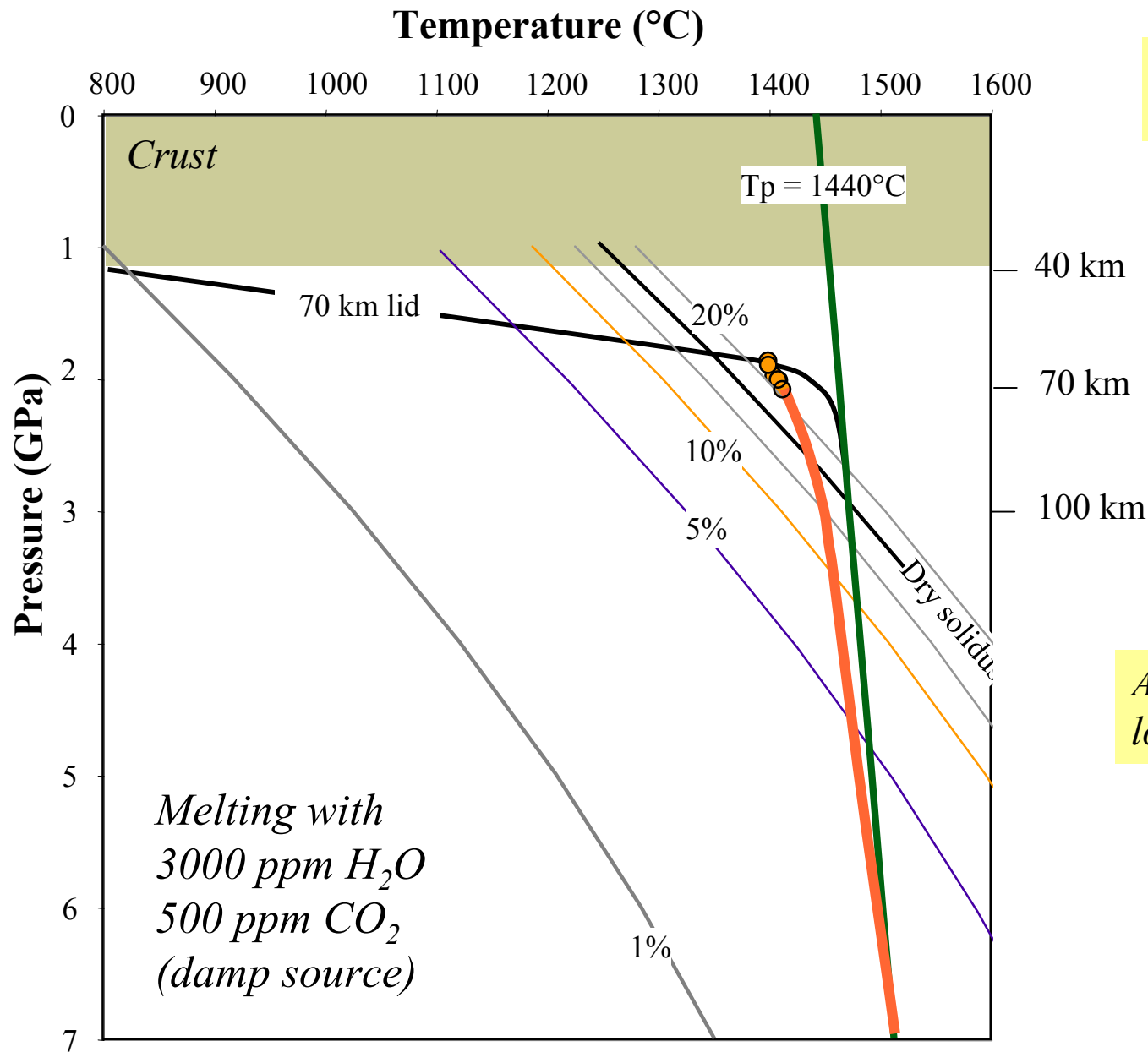
...and Damp



*Snow Canyon
magma equilibration*

Mantle is Hot

...and Damp

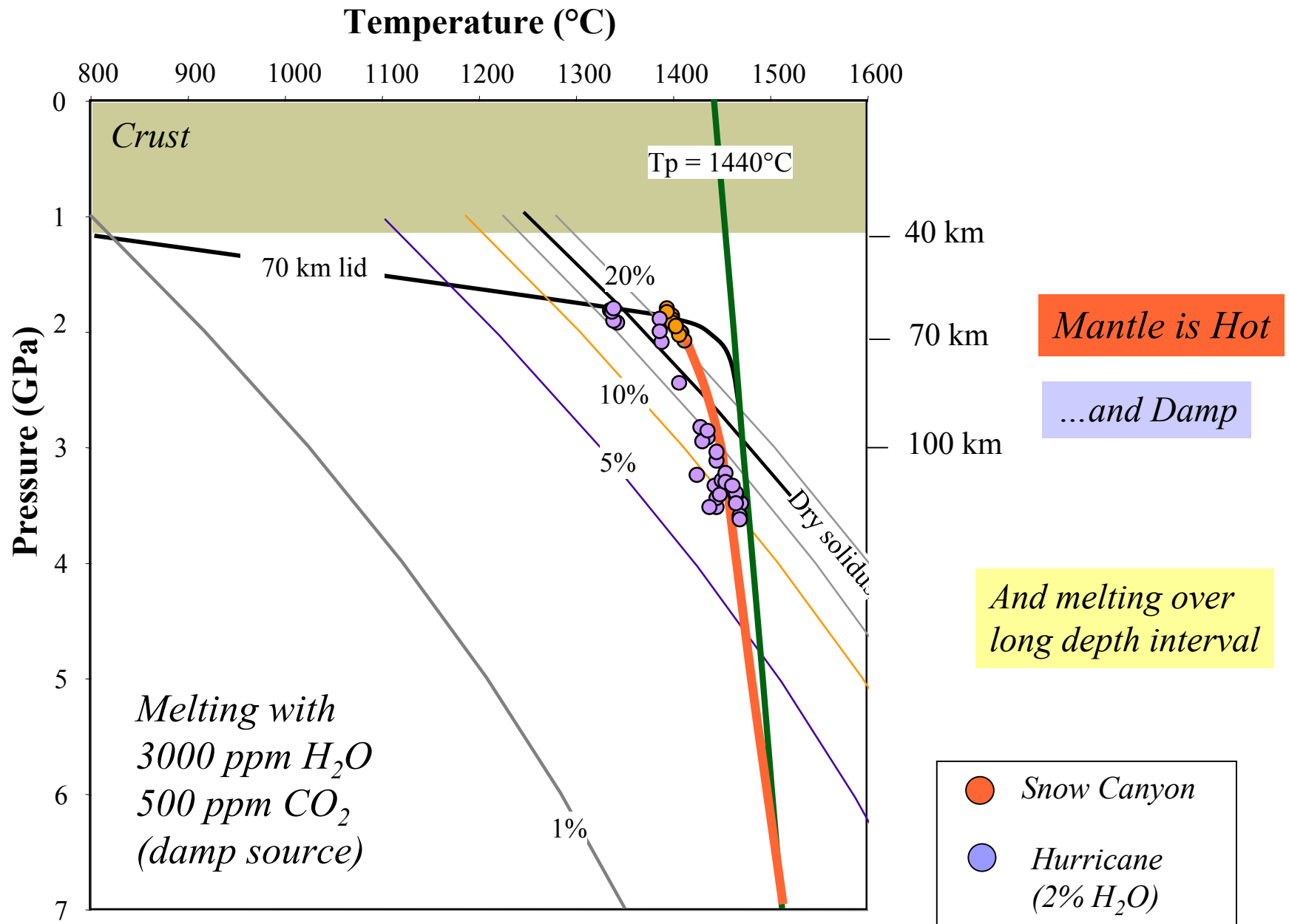


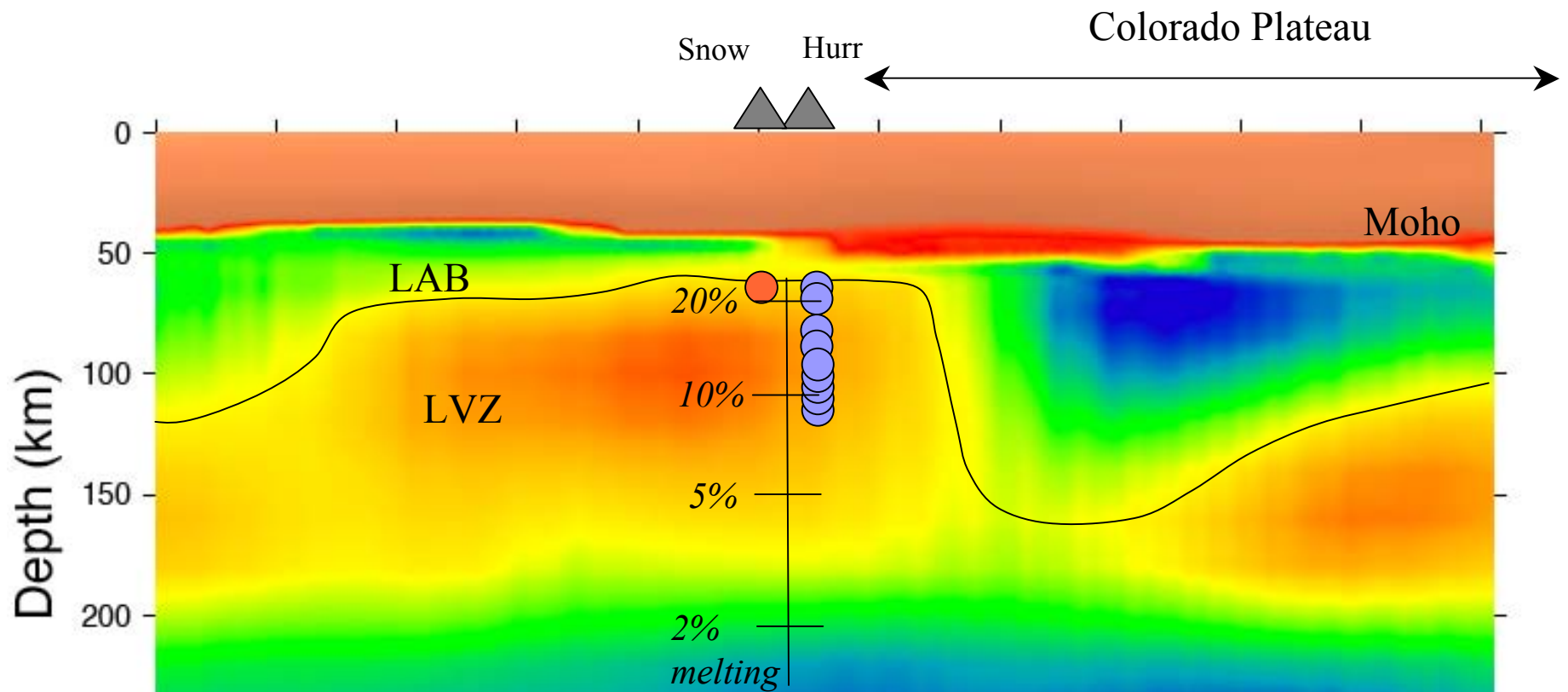
*Snow Canyon
magma equilibration*

Mantle is Hot

...and Damp

*And melting over
long depth interval*





- *Melting in asthenosphere....hot and damp*