The CAFÉ experiment: Imaging the complete pathway of melt and fluids beneath Mt. Rainier using seismic migration and magnetotellurics

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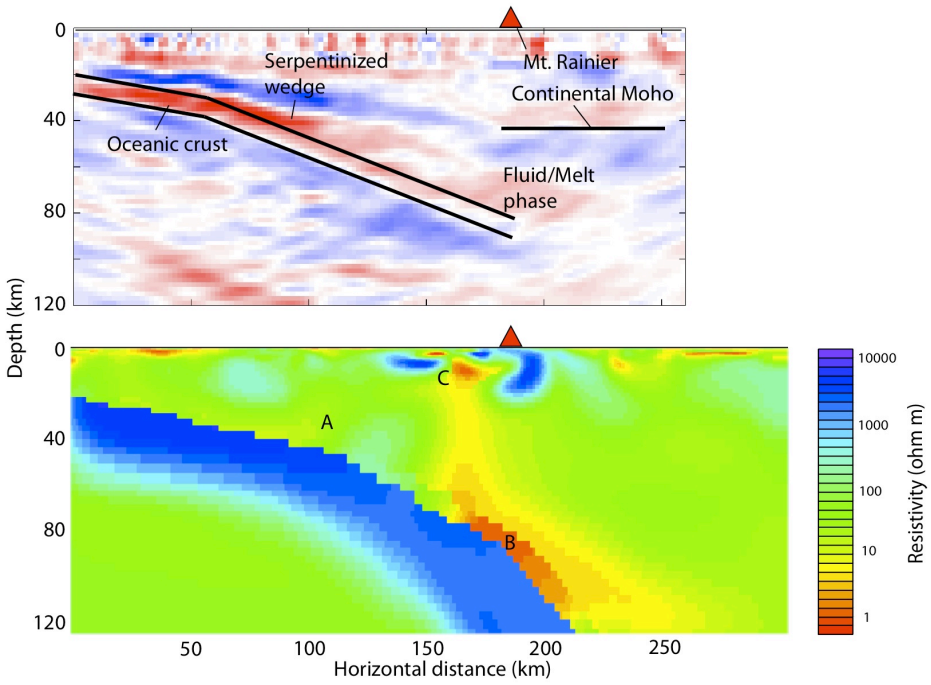
Arc magmas produced in convergent margins originate with the partial melting of the mantle. Fluids released from the descending slab through dehydration reactions can induce flux melting by lowering the solidus temperatures as they migrate into the mantle wedge. Alternatively, mantle flow induced upwelling can instigate melting through adiabatic decompression. The buoyant melts then make their way towards the surface to be stored in the crust or extruded as lava.

We present images generated by the inversion of seismic and magnetotelluric (MT) data collected from stations along dense, collocated arrays. The 2-D generalized Radon transform (GRT) migration method is particularly useful for highlighting sharp velocity boundaries, whereas the MT method is particularly sensitive to electrically conductive fluid phases and melt. By incorporating the information provided by the GRT migration a priori into the MT inversion process, we are able to produce an image that combines the strengths of both methods.

These images enable us to identify and connect fluid release at the top of the slab, migration of fluids into the overlying mantle wedge, melting in the wedge, and transport of the melt/fluid phase to a reservoir in the crust beneath Mt. Rainier.



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