| SF | A Numerical Investigation of the Relative Importance of Different Melting Mechanisms at Volcanic Arcs | |
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Although geochemical evidence exists for decompression and slab melting, they have been widely viewed as anomalous mechanisms occurring only under isolated conditions such as arc extension and near slab edges. This is because geodynamic models of subduction zones have not shown the required upwelling to produce decompression melting and have predicted slab surface temperatures (SSTs) 100s of ˚C too cold to melt even the subducting sediments at the top of the slab. As geodynamic models have become more realistic [*Conder et al., 2002*; *Conder, submitted*], decompression and slab melting mechanisms for magma generation appear possible without requiring anomalous conditions. The simple jump from geodynamic models with a constant viscosity structure to ones with temperature-dependent viscosity results in a change of corner flow regime from one with no upwelling to one with upwelling of hot asthenosphere beneath the arc (1st panel). As the rigid slab sinks, the viscously deformable, but high-viscosity lower lithosphere of the overlying plate is ablated with the descending slab. Hot, low-viscosity asthenosphere upwells into the subsequent gap triggering decompression melting.

A temperature-dependent viscosity structure results in increases of 100-200˚C in predicted slab surface temperatures (2nd panel, colored lines) as more cold lithospheric material is sequestered in the upper plate and inhibited from 'coating' the slab with an insulating layer, bringing slab surface temperatures close to that of the sediment solidus (dashed line [from *Johnson and Plank, 1999*]). Work to better treat the fault zone using a strain-rate and temperature-dependent rheology [*Conder, submitted*] increases the predicted slab surface temperatures even more. Further modeling will improve our understanding of the controls on, and the relative contributions of, each melting mechanism. At present, it is compelling to realize that island arcs may constitute a singular environment where magmatism has contributions from each of three possible melting mechanisms.

**Figures and Captions**

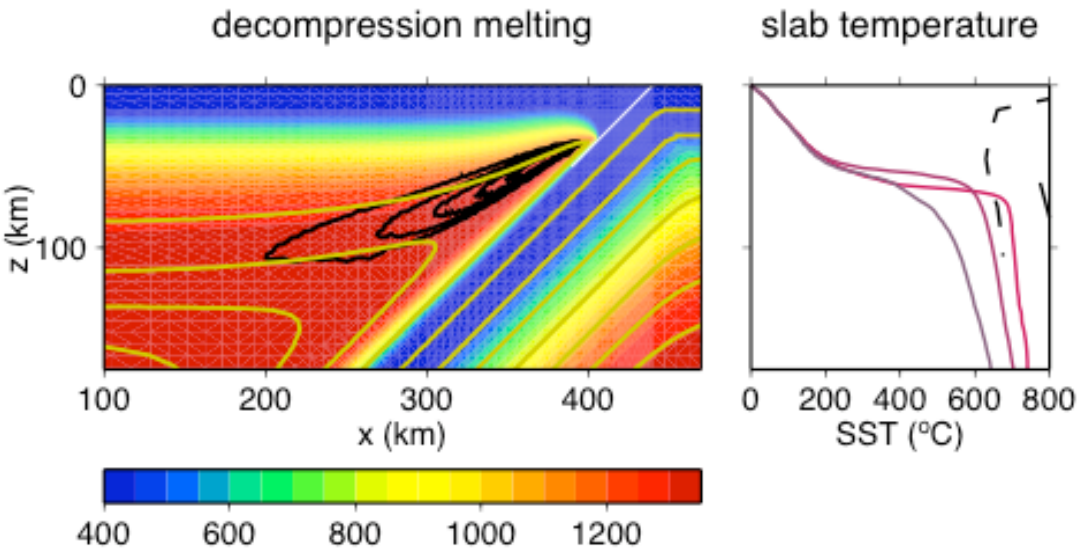


**Figure 1:** 1st Panel: Decompression melting model. 2nd Panel: Slab temperature. See text for further details.

**Publications and Presentations**

Conder, J. A., A case for a new fault zone parameterization in numerical viscous flow models of subduction zones, *submitted*

Conder, J. A., D. A. Wiens, and J. Morris, On the decompression melting structure at volcanic arcs and back-arc spreading centers, *GRL, 29, doi:2002GL015390,* 2002

Johnson, M. C., and T. Plank, Dehydration and melting experiments constrain the fate of subducted sediments, *Geochem. Geophys. Geosyst., 1*, 1999GC000014, 1999