Feeding Arcs: Numerical constraints on mantle melt compositions

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Our knowledge of subduction zone systems is greatly hampered by our limited observations of the mantle wedge processes, and our understanding of the nature and petrogenesis of arc melts is principally based on the combination of inverse models based on the arc-rock records, and melting/crystallization experiments. Numerical models of subduction dynamics allow exploring the physical parameters of subduction zones, and provide important constraints on any melt generation, but have, so far, provided limited petrological output. We have developed a numerical tool that combines thermodynamic data and thermomechanical modelling in an effort to constrain the magmatic outcome of subduction zones. We produce forward models with a self-consistent approach, i.e. using the same set of thermodynamic data thorough the entire explored P-T space to model dehydration, re-hydration, and melt generation. Our models setup allows tracking the change in composition as a function of P and T during slab devolatilization, and subsequent re-hydration and melting. In addition, it allows exploring the composition of primitive melts and how different melt transfer processes, from the source to the arc, affect the melt composition as it travel through the mantle wedge. Here, we use this model to explore the importance of P-T-X for melt generation, as well as the transfer mode in producing the final melt composition feeding the upper plate.