# A convergence rate control on subduction zone chemistry

JON WOODHEAD[1], JANET HERGT[1], BERIT OSTEBY[1], LOUISE EDWARDS[1], ALAN GREIG[1], ROLAND MAAS[1], MATT BLISS[1], WALLY JOHNSON[2] AND RICHARD ARCULUS[3]

[1]School of Earth Sciences, The University of Melbourne, Melbourne, Australia (*correspondence: jdwood@unimelb.edu.au)

[2](retired) Geoscience Australia, Canberra, Australia

[3]Research School of Earth Sciences, The Australian National University, Canberra, Australia

The chemistry of new crust formed at convergent plate boundaries is intimately tied to nature of the oceanic plate being subducted – its temperature, age and the composition of the basalts and sediments of which it is comprised. The role of the latter has been a central theme in subduction zone studies for many decades with strong evidence to suggest that at least some of the chemical traits of arc lavas mirror those of their respective subducting slab (predominantly sediment) inputs. Although there is widespread agreement on this aspect of magmagenesis, much debate still surrounds the process of mass transfer between subducting slab and mantle wedge—in particular whether this is mediated by slab-derived melts, aqueous fluids released during mineral dehydration reactions within the slab, or indeed via so-called 'supercritical fluids' which transcend the boundaries between the two. In this study we investigate the importance of convergence rate in determining the relative roles of fluid and melt contributions to arc magmagenesis. We focus on a short (~200km) segment of the New Britain arc front where GPS measurements have revealed a monotonic increase in convergence rate in passing from west to east. In both the entire volcanic rock dataset, and more clearly in the least-differentiated samples, there are pronounced correlations between many geochemical parameters and convergence rate providing insight into the transition between aqueous fluid and melt modes of element transfer. At least some of these observations are also mirrored in global datasets, albeit slightly blurred at this level by compositional variations in the subducting assemblage. These observations provide an important constraint on models of magmagenesis in subduction systems, and also have important ramifications for the nature of slab residues passing into the deeper mantle.