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# Arc-continent collision in numerical models

Joya Tetreault (1) and Susanne Buiter (2,3)

(1) Exploro AS, Trondheim, Norway (joya.tetreault@exploro.no), (2) Geodynamics Team, Geological Survey of Norway (NGU), Trondheim, Norway, (3) Centre for Earth Evolution and Dynamics, University of Oslo, Oslo, Norway

Island arcs are the main ingredient in creating new continental crust, as evident by their commonly felsic composition. However, a review of present-day island arcs reveals that not all have such an overall felsic composition and many have an ultramafic crust-mantle transition layer (CMTL). In general, observations of accreted terranes that are made from island arcs show that these are often composed of the upper to middle crustal layers. This implies that these mafic crustal layers could be removed by regular arc processes or during arc-continent collision and therefore not added to continental crust. But in some cases, such as the accreted Talkeetna and Kohistan arcs, the ultramafic CMTL is found in accreted island arcs, so we know that some situations must allow the stratigraphy from the entire arc crust to be added to a continent.

Quite naturally we then wonder: what are the controlling parameters that determine the amount of island arc crust that is accreted to continents during arc-continent collision? Geological observations tell us that arc-continent collisions can occur in different configurations, such as forward-facing collision, backward-facing collision, and back-arc closure between island arcs and continents. These different arc-continent collision scenarios should be reflected in different accreted crustal volumes, terrane configurations, and collisional structures.

Geodynamic experiments can help us understand how island arc crust deforms during arc-continent collision and highlight the processes that lead an island arc from arc-continent collision to an accreted terrane. Our numerical experiments show that backward-facing arc-continent collision can result in accreted terranes that range from small slivers of the upper crust up to entire accretion of the arc crust, including parts of the CMTL. During collision, large shear zones develop in the colliding arc crust, which serve to accrete large nappes of arc crust to the overriding continent. We find that in these settings the depth of intra-arc detachment layers controls the amount of arc crust accreted. We aim to complement these experiments with models that examine island arc accretion in forward-facing collision to unravel whether the tectonic setting plays a major role in controlling the amount of accreted island arc crust.