Geophysical Research Abstracts
Vol. 21, EGU2019-9716, 2019
EGU General Assembly 2019

How back-arc spreading affects the arc magmatic activity

Valentina Magni
University of Oslo - CEED, Centre for Earth Evolution and Dynamics, Oslo, Norway (valentina.magni@geo.uio.no)

Back-arc spreading is a common feature in subduction zone settings in which the overriding plate is under extension. The way back-arc and arc magmatic magmatism interact and evolve when changes in subduction dynamics occur is still poorly understood. Moreover, the mantle flow associated to subduction can have an important role in volcanic activity, since it can affect and modify its source. In this study, I use three-dimensional numerical models of back-arc basins formation during oceanic subduction to investigate how melt production evolves in different regions of a subduction zone. I vary the initial geometry and composition of the subducting plate to obtain different mantle flow patterns.
My results show that back-arc spreading can be responsible for changes in arc activity and magmatic composition. Indeed, for about 10-15 Myrs during back-arc spreading, the mantle that flows beneath the arc comes from the back-arc melting region, where it has been already partially depleted. Therefore, during this phase, arc activity might decrease or stop because its source is highly depleted. Moreover, the models show that the toroidal flow around the edge of a slab that is retreating and rotating has a strong upwelling component that brings fertile mantle to the back-arc and sub-arc melting regions. However, this is not observed when the toroidal flow occurs through a newly formed slab window. In this case, the mantle flows sub-horizontally at >200 km depth and does not take part in melting. These results demonstrate the key role of mantle flow and changes in its pattern in subduction-related volcanic activity and composition.