Geophysical Research Abstracts
Vol. 16, EGU2014-2235, 2014
EGU General Assembly 2014

Collision zone magmatism aids continental crustal growth

Ivan Savov (1), Khachatur Meliksetian (2), Halama Ralf (3), Navasardian Gevorg (2), Connor Chuck (4), D'Antonio Massimo (5), Agostini Samuele (6), Ishizuka Osamu (7), Karapetian Sergei (2), and Karakhanian Arkadi (2)

(1) University of Leeds, United Kingdom (i.savov@see.leeds.ac.uk), (2) Armenian Academy of Sciences, Geological Institute, Armenia, (3) University of Potsdam, Germany, (4) University of South Florida, USA, (5) University of Napoli, Italy, (6) CNR-Pisa, Italy, (7) Geological Survey of Japan/AIST, Japan

The continental crust has a broadly andesitic bulk composition and is predominantly generated at convergent margins. However, estimates of the bulk composition of oceanic arcs indicate a bulk composition closer to basalt than to andesite. Hence, reworking processes that transform basaltic island arc crust into andesitic continental crust are essential[1] and explaining growth of andesitic continental crust via accretion of arc crustal fragments remains problematic. Recent studies of magmatism in the Great Tibetan Plateau[2], as site of multiple and still active continent-continent collisions, have proposed that andesitic CC is generated via amalgamation of large volumes of collision-related felsic magmas generated by melting of hydrated oceanic crust with mantle geochemical signatures. We aim to test this hypothesis by evaluating geochemical data from the volcanically and tectonically active Lesser Caucasus region (Armenia, Azerbaijan, Georgia and E. Turkey), as the only other region where active continent-continent collision takes place. We will benefit from the newly compiled volcano-tectonic database of collision-related volcanic and plutonic rocks of Armenia that is comparable in quality and detail to the one available on Tibet. Our dataset combines several detailed studies from the large Aragats shield volcano[3] and associated monogenetic volcanic fields (near the capital city of Yerevan), as well as > 500 Quaternary to Holocene volcanoes from Gegham, Vardenis and Syunik volcanic highlands (toward Armenia-Nagorno-Karabakh-Azerbaijan-Iran border). The Armenian collision-related magmatism is diverse in volume, composition, eruption style and volatile contents. Interestingly, the majority of exposed volcanics are andesitic in composition. Nearly all collision-related volcanic rocks, even the highly differentiated dacite and rhyolite ignimbrites, have elevated Sr concentrations and 87Sr/86Sr and 143Nd/144Nd ratios varying only little (average $\sim$ 0.7043 and $\sim$ 0.51282, respectively). These isotopic signatures are much more similar to those typical of intra-oceanic subduction zones than those typical of continental crust, likely due to the very young age of the rocks. In contrast, trace element abundances reveal many similarities to average CC, such as Nb-Ta and Ti troughs and Pb peaks. The range of d11B isotope ratios (-8.7 to +2.1 per mil) signifies magmas originating from moderately metasomatised (arc preconditioned) mantle sources. Our combined results reveal that the collision-related mantle melting is capable of generating large volumes of plutons and volcanic rocks that resemble (although not perfectly) the composition of the average CC. We will attempt to use the new combined datasets in order to quantify the importance of the collision zone magmatism for continental crustal growth.

[1] Lee et al. (2007) EPSL 263, 370–387; [2] Niu et al. (2013) Earth-Science Reviews 127, 96-110; [3] Connor et al., (2012) J.Applied Volcanology, 1:3, 1-19.