Geophysical Research Abstracts
Vol. 16, EGU2014-5622, 2014
EGU General Assembly 2014

Mineralogical inheritance in partially molten rocks: implication for fabric resetting in granitoids

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During orogenic processes continental crust experience significant partial melting. Repeated thermal pulses or fluctuation in water content can even cause multiple anatectic events that result in complex intrusion suits. There are numerous studies regarding chronology of such intrusions or origin of the magmas. However, there is lack of microstructural characteristic of such remelting/infiltration processes. How do we distinguish the newly derived melt from the inherited magmatic crystals? What is the resulting microstructural appearance of such "mixed" granite? And importantly how does new melt presence impact on fabric recorded in these granites?
We investigate extensive granitoids complex in the Vosges Mountains in Eastern France. This complex reveal two main generations of magmatic rocks. The first event occurred at ca. 340Ma, is associated with extensive Mg-K magmatism and is related to building of thick orogenic root and subsequent exhumation of deep crust to shallower crustal levels. These granitoids intruded all crustal levels. The second magmatic event occurred at ca. 325 Ma and affected exclusively the mid-crustal level. This magmatic event produced large quantity of felsic anatectic melts which further pervasively intruded and compositionally and texturally reworked previously formed magmas.
The detailed field and microstructural observations revealed a transition from granites that has been completely reworked by the infiltrated melt to granites that preserve former magmatic assemblage and have only incipient amount of the new melt. The new from melt crystallized material form narrow, fine-grained pathways along grain boundaries or cuts across pre-existing magmatic grains. With increasing amount of the newly crystallized material the original magmatic xenocrysts are resorbed and show highly corroded shapes. The early formed feldspar and quartz grains have strong compositional zoning, with cores reflecting original magmatic composition and rims showing later multiple melt overgrowths. Original magmatic feldspars, biotite and Fe-oxides have different composition then the new phases crystallizing in the partially molten granite. The anisotropy of magnetic susceptibility (AMS) study shows that the original Vosges granitoids fabric was either preserved or completely reworked by the growth of new magnetic phases. The degree of fabric reworking corresponds to the proportion of the newly crystallized material.
We suggest, that the new melt pervasively migrated through the older granitoids resulting in mixture of inherited "xenocrysts" and of new from melt derived crystals. The interaction between new magma and previously crystallized magmatic rock results in variety of granite textures and fabrics. These reflect different degree of equilibration between the bulk rock and the passing melt.