Magnetic properties of ilmenite-hematite containing magnetite nano-crystals

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This study investigates changes in the rock magnetic properties of single crystals of ilmenite-hematite from the Ecstall pluton containing nm-sized magnetite crystals that formed as a result of reheating by the adjacent Quottoon plutonic complex. Measurements of hysteresis properties, low temperature remanence, room temperature IRM acquisition, and observations from magnetic force microscopy (MFM) and off-axis electron holography show that samples fall into 3 groups, which are defined by the presence of mineral microstructures documented in *Brownlee et al.* [2010], which are in turn related to distance from the Quottoon plutonic complex. Ilmenite-hematite grains from the two groups closest to the Quottoon plutonic complex contain nm-sized magnetite crystals within hematite and ilmenite lamellae. Reheating of the Ecstall pluton led to an increase in coercivity and overall magnetic intensity, as well as the development of mixed phase hysteresis. Though the potential for lamellar magnetism exists in all of these samples, off-axis electron holography results indicate that the magnetic signal is dominated by magnetite precipitates at intermediate distances from the Quottoon plutonic complex. Increased single grain coercivity may reflect further development of exsolution lamellae at very close distances to the Quottoon plutonic complex. These results indicate that reheating had a profound affect on the overall magnetic properties of the Ecstall pluton through the growth and modification of Fe-Ti oxide microstructures.

Fate of an Eocene HT metamorphic complex in a forearc location

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The Chugach and St Elias mountains in southern Alaska are a peculiar and interesting region from many geological aspects. For example, this area encloses a high temperature Eocene complex (CMC) developed in a Late Cretaceous accretionary prism: such a high-thermal regime is uncommon in a subduction setting during the Phanerozoic. In addition, this investigated area is also currently the focus of intense research related to the coupling of surface processes (glacial erosion) and tectonics, since fast Neogene exhumation rates have been observed in areas of intense glaciation [1]. Therefore, in order to understand links between crustal thermal evolution, metamorphism, deformation and erosion in this area, it is crucial to obtain a detailed description of its PTdt-evolution through time. For this purpose, aspects of metamorphic petrology, geochemistry, structural geology and geochronology are combined and presented in this contribution to develop a crustal scale geodynamic model of this region.

The CMC is more than 300 km long, made up of metasediments associated with an amphibolite layer in its southern part. Detailed petrological work across several parts of this complex permits to discuss the uncommon presence of such a HT complex in a forearc location. Results highlight a pressure gradient from north to south and an interesting behaviour of the southern amphibolite belt that make up the suture between the CMC and the outboard accreted terrane. In addition, our dataset including detailed structural geology and geochronology suggests that fast burial and exhumation rates in this region do not only occur in the Neogene but also during the Eocene. Our new results assess that exhumation from depths of >20 km in parts of the complex were accompanied by erosion at the surface. Our data set documents a complex deformational and thermal history including accretion of sediments, subsequent vertical flattening leading to compressed isotherms, followed by dextral transpression, exhumation and erosion within a short time period of ca. 10-15 Ma.

[1] Enkelmann *et al.* (2009) *Nature Geoscience* **5**, 360-363