

Understanding the effect of chemical alteration on palaeomagnetic signals

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Abstract: For more than 50 years, palaeomagnetic research has yielded critical insights into the formation and evolution of the Earth, from generation of the geomagnetic field in the core, to plate tectonics and structural deformations of the Earth's crust. Chemical alteration of magnetic minerals is the most common cause of sample rejection in palaeomagnetic studies, but its effects are often undetectable in normal laboratory analysis, leading to erroneous observations of both the direction and intensity of the ancient magnetic field. Nevertheless palaeomagnetic studies remain one of the most important ways in which we can investigate theories of the origin and behaviour of the geomagnetic field. Furthermore the fundamental magnetic properties of minerals are making increasingly important contributions to geological, archaeological and environmental studies. Despite the widespread recognition that chemical alteration remains one of the most significant barriers to increased reliability of mineral magnetic analysis, progress in its understanding has been prevented by inadequate analytic and theoretical tools. This talk reports a recently completed Natural Environmental Research Council (UK) project, which used recent technological advances in direct observations of magnetic structures, magnetic measurements as well as improvements in micromagnetic theory, to help us understand the effects of chemical alteration on a titanomagnetite crystals.