

Paper Number: 1026

**Rcrust: a new *P-T-X* modelling tool and application to melt loss**

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Earth's continental crust is stabilised by crustal differentiation that is driven by partial melting and melt loss: Magmas segregate from their residuum and migrate into the upper crust, leaving the deep crust refractory. Thus, compositional change is an integral part of the metamorphic evolution of anatectic granulites. Current thermodynamic modelling techniques have limited abilities to handle changing bulk composition. New software is developed (Rcrust) that via a path dependent iteration approach enables pressure, temperature and bulk composition to act as simultaneous variables. Path dependence allows phase additions or extractions that will alter the effective bulk composition of the system. The new methodology leads to a host of additional investigative tools. Singular paths within pressure-temperature-bulk composition (*P-T-X*) space give details of changing phase proportions and compositions during the anatectic process, while compilations of paths create path dependent pseudosections. A case study is used to investigate the effects of melt loss in an open system for a pelite starting bulk composition. The study is expanded upon by considering multiple *P-T* paths and considering the effects of a lower melt threshold. It is found that open systems produce less melt than closed systems and that melt loss prior to decompression drastically reduces the ability of the system to form melt upon decompression.

