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THERMAL HISTORY: A numerical Code to interpret zoning Profiles in Garnet

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Chemical zoning profiles in garnet porphyroblasts formed by diffusion bear important information on the time-temperature evolution of metamorphic terrains. In particular the exchange of Fe and Mg at the contact to biotite and the interdiffusion of Fe and Mg within the garnet crystal have been subject of numerous studies to unravel cooling histories of metamorphic terrains. Since the first numerical approach to model chemical zoning caused by diffusion (Anderson and Buckley, 1973), a great variety of codes with an increasing number of improvements was published (e.g. Ehlers et al., 1994).However, all these sophisticated codes are characterized by a deficit of usability as there is no graphical user interface (GUI), as they are dependent on a specific computer platform, or require the compilation of the source code.

The finite difference code THERMAL HISTORY presented here is available as a java applet which overcomes these problems. This 1-dimensional spherical diffusion code is platform independent, it does not require compilation, or a hard disk install. It is the aim of this study to offer a fast diffusion code for garnet-biotite couples to an audience without coding experience. A modern GUI allows to set model parameters and to immediately observe the results of the calculations as graphical output. Linear, concave (used by the analytical solution of Dodson (1975)) and user defined cooling curves can be modeled. Mass balance between garnet and biotite is considered by the code. A facility to calculate sections through the diffusion profile is provided. The section facility allows exploring the influence of the sectioning effect on the diffusion profile, and can be used to determine both: the cooling rate and the actual size of the garnet grain.

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