Simulation of isotope redistribution in a contact aureole - Excess argon wave

HIRONOBU HYODO[1]

[1]IFST, Okayama Univ. of Sci., Okayama, Japan

Age resetting and fluid

In many contact studies for age dating to reveal diffusion characteristics of minerals, it is assumed that accumulated radiogenic isotopes in minerals do not remail but evacuated after its release from the host mineral. Thus, expected results are total or partial reset of ages around intrusives. The extensive studies have been carried out particularly in K-Ar systematics since the first discovery of age resetting pattern by Hart [1]. On the contrary to previous results, Hyodo and York [2] reported an asymmetric but systematic excess argon distribution in a Cambrian dyke contact aureole. Systematic distributions of excess argon have also been found in several tectonic boundaries. These facts suggest an involvement of fluid in such redistribution of isotopes.

Simulating a thermal history of a dyke intrusion by a mathematical model, and assuming weak convection current in a country rock, we have modelled a time dependence of argon pressure in the country rock (Figure 1). The results clearly illustrates that increase of argon pressure moves like a surging wave.

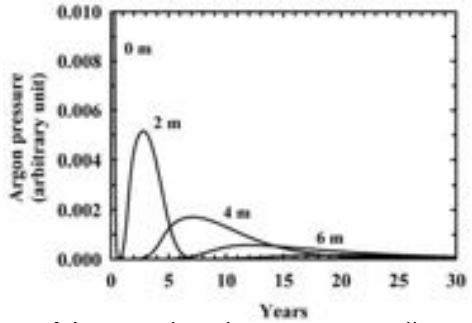

Figure 1 Time variation of argon pressure in the country rock around a 40-m-wide dyke. The numbers denote the distance from the contact.

Summary

Presence of two minerals with different (low- and high-) argon retentivities creates an environment for excess argon acquisiton. The calculation scheme is solely based on a simple mathematical diffusion model, thus it is applicable to any isotope redistribution.

[1] Hart, S.R. (1964) *J. Geol.*, **72**, 493-525. [2] Hyodo, H. and York, D. (1993) *Geophys. REs. Lett.*, **20**, 61-64.