ON THE HYDRATION OF HIGH-GRADE METAMORPHIC TERRANES

Schorn, S.[1] & Stüwe, K.[2]

[1]Department of Geological Sciences, University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa
[2]Department of Petrology and Geochemistry, NAWI Graz Geocenter, University of Graz, Universitätsplatz 2, A-8010 Graz, Austria
e-mail: simon.schorn@hotmail.com

Pervasive hydration of previously dry metamorphic rocks is a common process in many metamorphic terranes. However, although hydration reactions are ubiquitous and the `catalysing effect' of water is commonly accepted, the actual processes of catalysis during pervasive hydration remain poorly understood. We suggest that (1) the exothermicity of hydration reactions may provide thermally buffered intervals of near-constant temperature that favour equilibration and that (2) hydration catalyses equilibration mainly due to the dramatic sudden increase of the equilibration volume and the related effective bulk composition. By comparison, the fluid-effect of erasing kinetic barriers may be subordinate. In order to test these two hypotheses, we explore the relationship between temperature (T), bulk composition (B) and time (t) on a new diagram – the TBt diagram. For the 1st hypothesis we model the energetics of metamorphic hydration reactions to predict buffering intervals in T–t space. For the 2nd hypothesis we design non-linear paths through compositional space based on the ratio between intra-grain and grain-boundary diffusivities and chemical potentials to constrain bulk compositional changes through time, temperature and infiltration events: the B axis of the TBt diagram. Ultimately, the predictions of quantitative paths on the TBt diagram will also help to constrain questions on the origin of late stage fluids. Predictions are tested against observations from the Plankogel Unit. This unit forms the hanging wall of the eclogite type-locality in the Eastern Alps and features pervasively re-hydrated greenschist- to amphibolite facies assemblages of Eoalpine age that pervasively overprint drier Permian parageneses.