

Interactive comment on “Beo v1.0: Numerical model of heat flow and low-temperature thermochronology in hydrothermal systems” by Elco Luijendijk

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My apologies for the late review. I have read the manuscript and since I am not an expert in the field of thermochronology, I will comment on the mathematical and numerical formulation. The paper presents a code solving an advection-diffusion equation for temperature, together with an advection-diffusion equation for helium concentration which is treated as a tracer and complex boundary conditions. The manuscript is overall well written and should be published after addressing minor issues. My main comments are on section 2.

In this section, the author is presenting a complicated combination of constitutive laws

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and empirical relationships to provide a better boundary condition for the temperature, accounting for the air layer with its humidity and etc. Despite putting all this detail in the BC however, the author is ignoring phase transformations like vaporisation, which will transform his temperature equation from quasi-linear advection-diffusion to nonlinear advection-diffusion-reaction equation. Rather than that, he is using the boiling temperature curve to cap the temperature. Although he discusses his choice on page 6, line 1-5, the importance of implementing a complicated BC instead of accounting for this mechanism is not obvious to me. I would appreciate if the author could comment on that in the revised version.

In addition, I haven't understood if the code can handle strongly advecting cases, and if yes what kind of unwinding has it been used? All the examples presented seem to be strongly diffusive.

Other than that, I would appreciate if you could explain in more details the transition from Eq. 3 to Eq. 4. I got a bit lost with the nomenclature.

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