The reviewer's reports have come in and I am happy to inform you that your manuscript has been accepted subject to minor revision. Could you please update your manuscript to address the comments and suggestions by reviewer #1.
Thanks and all the best.

Lutz Gross

The authors thank the editor and the reviewers for the time and effort they have dedicated to provide a constructive revision of this work. All comments have been of great help to improve our paper. The manuscript is now updated to address the latest technical comments from reviewer #1, and we believe that it is now suitable for publication in GMD.

Below, we report the point-by-point answer to the reviewer's minor comments.

Federico Brogi, on behalf of all authors

Referee #1

Line 174: I agree that, in general, the viscosity of magma expressed in Pas, is a number greater than 1 so that $\log \eta > 0$. However, I thing that the range of validity of eq.(3) is more affected by the behaviour at low temperatures, when T reaches the value of C and the expression on the right diverges. It should be noted that the right hand of eq.(3) has no physical meaning for $T \le C$, not for $\log \eta < 0$.

Following the reviewer's suggestion, we have now clearly stated in the paper that eq. (3) is not valid for $T \le C$ and added a relevant reference.

line 174: *Let us also note that eq. 3 has no physical meaning for T ≤C (Mauro et al., 2009).*

Equation (4): The use of the diffusion coefficient D (in terms of gradient of concentration) and of the mass transfer coefficient k (in terms of difference of concentration between two points) are alternatives. Please, check if both k and D are required in your transport equation. You can also easily perform dimensional analysis to check that.

We thank the reviewer for spotting this: Equation (4) is indeed not correct. Following the reviewer input we have expanded and corrected this paragraph to make it clearer and consistent. In order to avoid ambiguous or misleading definitions, the units for each quantity we refer to in the equations are now specified.

line 176: *Models accounting for multicomponent phase change require a description of the evolution of the composition at the interface between phases. The mass transfer rate (per unit volume of liquid+gas) of a volatile component can be defined as the product between the interfacial mass flux Ji [kg/(m^2s)] and the interfacial area concentration A [m^2/m^3]*

$$\Gamma i = JiA \qquad (4)$$

The area concentration A is determined by the geometrical configuration of the gas-liquid interface and hence it is strongly dependent on the flow regime. It can be computed using simple geometrical assumptions on the dispersed phase (e.g. monodisperse bubbles with constant radius) or, for more complex flow scenarios, with additional transport equations (e.g. IATE model (Ishi and Hibiki, 2006)). The model for Ji expresses the driving force for diffusive mass transfer of the component i and can be calculated with the following relationship

$$Ji = ki\Delta Ci \qquad (5)$$

where ki [kg/(m^2 s)] is the mass transfer coefficient, a function of the diffusion coefficient Di (Cussler, 2009; Thummala, 2016), and ∆Ci is the difference between the mass fraction of the specie in the phase (Ci) and at the interface (Cfi) …