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Interactive comment on "Thermal conditions during deformation of partially molten crust from TitaniQ geothermometry: rheological implications for the anatectic domain of the Araçuaí belt, Eastern Brazil" *by* G. C. G. Cavalcante et al.

Anonymous Referee #2

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The paper includes a interesting dataset and well discussed consequences. The logic between the measurements and the topic8s) of the discussion is not easy to follow. A better connection between the data (T data) and the discussion (viscosities and geodynamic consequences) would be helpful. The paper uses well the TitaniQ approach to estimate the crystallization evolution of partially molten rocks. The data are well measured, whereas some problems exist with the presentation and calculations. As shown by Thomas et al. (2010) the TitaniQ thermometer is pressure dependent and the Wark and Watson (2006) calibrations are well done mainly for 1 GPa. The general

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lower presusures of this study require a pressure correction (Thomas et al. 2010). Why are the TitaniQ temperatures so similar? Do you consequently select only the quartz grains crystallizing from a melt? What is about possible other quartz crytsals (relics of the metamorphic reaction described in your exchange thermometers)? In the case of concentrating only of the newly crystallizing quartz some words for the calibration of Huang and Audetat (2012) would be helpful.

The nomenclature and description of the rocks are confusing. There are anatexites in the "anatectic-unit" versus migmatites. If I understand the text correct, the area does NOT have migmatites without partial melting. All described units are all anatextites, are they? The main differences are the type and amount of partial melting? You may followed the nomenclature given in Sawyer (2008).

The calculations for the viscosity are not clear to me. You calculate the solid/liquid proportion for a given P and T with a leucosome composition. All the following calculations are based on such a leucosome composition, are they? What is with the mesosome? The bulk viscosity of the migmatite will depend on the bulk rock behavior. The generation of the leucosome is part of the partial melting and segregation processes of the bulk system. The final viscosity of the segregated leucosome is only a part of the system.

Detail comments:

The Table 1 has no analytical errors. I think the table is not necessary in this detail. "0.0" occur in Table 3, which is not possible. You may either not measured this element or the concentration is below the detection limit of your method. Table 3 has no clear relations to the samples. The first ∼20-30 rows are one sample? In this case the analysis are in analytical error and only one representative analysis per mineral would be enough. If these are different samples you have to show it. Table 4 is important data set for the calculations, but it is not described how you measured it. How did you extract the leucosome? It has a lot of Fe2O3 and MgO for a pure leucosome. What is

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the reason for the 0.8 wt% LOI? Are the feldspars altered? Are many hydrous phases in the leucosomes? If yes, why? Some additional references: Huang and Audetat (2012) The titanium-in-quartz (TitaniQ) thermobarometer: A critical examination and re-calibration. Geochimica et Cosmochimica Acta, 84, 75–89 Sawyer (2008) Atlas of Migmatites. The Canadian Mineralogist Special Publication 9. Thomas et al. (2010) TitaniQ under pressure: the effect of pressure and temperature on the solubility of Ti in quartz. Contrib Mineral Petrol, 160, 743–759.

Interactive comment on Solid Earth Discuss., 6, 1299, 2014.