

October 10, 2015

Dear editor,

Please find attached a manuscript describing my recent work on excess properties in solid solutions, which I hope you will consider for publication as an *Article* in *Earth and Planetary Science Letters*. My study is entitled *Excess thermodynamic and elastic properties of mineral and melt solutions: modelling and implications for phase relations and seismic velocities*.

This work provides a foundation for modelling bulk moduli and other excess properties within standard solution model frameworks. Traditionally, the properties of solutions have been defined in terms of Gibbs free energy excesses, with or without optional constant excess volumes and entropies. Increasing use of solution models in seismic studies raises the question of how good or bad the constant volume approximation is in predicting seismic velocities. I show that in the cases where excess volumes are large, errors in calculated bulk modulus are also large. The general decay of excess volumes with increasing pressure also has a large impact on phase relations.

I expect that this work will be useful for experimental mineral physicists modelling elastic properties of minerals, to seismologists and petrologists working on the composition and physical properties of the mantle and core, and to planetary scientists working on the differentiation of planetary embryos.

I confirm that the accompanying manuscript is original work, not published elsewhere or under consideration for publication elsewhere. I have no financial conflicts.

Best wishes,

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