

Interactive comment on “Energy of plate tectonics calculation and projection” by N. H. Swedan

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Received and published: 26 May 2013

I would like to thank Mr. Grose for submitting this short comment.

The quoted paragraph by Mr. Grose is not from the manuscript; it is in response to my reply to Mr. Grose’s revised Short Comment submitted on April 29, 2013, which includes the word bladder. The magma chamber in the discussion is that located at midocean ridges. This is the only magma chamber discussed in the manuscript.

The word bladder is not used in the manuscript. As will be explained, I feel that it is not wrong to use the term bladder. However, the term chamber must be used at all times for consistency with science terminology.

A chamber has solid walls that do not deform under pressure. Its volume remains unchanged and can be thought of as incompressible chamber. A bladder, on the other

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hand, does deform under pressure.

The origin of the schematic representation of Figure 1, page 160, is discussed on page 137, lines 8, through line 16 of page 138. Based on Floyd (1991), pages 31 and 127, the uplifted lithosphere at midocean ridges encloses a magma chamber located beneath the ridges. The uplifted lithosphere constitutes the upper wall of the magma chamber. We know well that the lithosphere expanded at midocean ridges upwards under the pressure resulting from mantle partial melting, and the lithosphere at midocean ridges is presently expanding upward with climate change, (Sjoberg L. E. et. al 2004). Therefore, using the word bladder is not wrong; however, chamber is the proper term to use for consistency, and only this term, chamber, is used throughout the manuscript.

The uplifting, or expansion, of the lithosphere at midocean ridges is caused by magma flow upward under magma pressure, because the solid earth below is incompressible, and magma cannot flow downward as a result. This certainly relieved some of the pressure and some of the energy is consumed to uplift midocean ridges. This energy, however, is returned in full by gravity as ridge push. Please see lines 18 through 25 of page 147. The incompressibility of the mantle acts as a solid wall and magma flow has to seek the path of least resistance—upward only, which is observed.

There is no evidence that the magma chamber in consideration is being displaced say downward at least. Otherwise, midocean ridges would be sinking, which is not observed. They are rising instead.

Interactive comment on Solid Earth Discuss., 5, 135, 2013.

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