

Interactive  
Comment

# ***Interactive comment on “Short-lived tectonic switch mechanism for long-term pulses of volcanic activity after mega-thrust earthquakes”*** **by M. Lupi and S. A. Miller**

## **Anonymous Referee #1**

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### General comments

This paper provides a concise argumentation for a mechanism that may explain long-term pulses of volcanic activity subsequent to mega-thrust earthquakes. The description is clear and my comments are more stylistic than anything else.

### Specific comments

### Conclusion

Line 23: None of the mega-thrust earthquakes happened 10 years ago.

### Technical corrections

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## Abstract

Line 22: We find that all but one of the shallow earthquakes. . . Line 23: We suggest that. . . Line 26: [. . .] may be followed closely by indications of rising magma to shallower depths, e.g. surface inflation and seismic swarms.

## Introduction

Line 10: “is partly due to” – not is due in part to Line 28: “strike-slip” – not strik-slip

## 2 Short-lived tectonic switch: proposed mechanism

Line 11: “promotes an increase of volcanic activity” – not promotes increases of volcanism Line 27: “This stress state favors sill development and thrust faulting, but hinders vertical dike formation. . .” Line 6: “Ignoring [. . .] are coupled. Both,  $\sigma_H$  and  $\sigma_h$  are continuously reduced during the relaxation process, even though  $\sigma_h$  is reduced at a slower rate.”

## 2.1 Supporting arguments

Line 15: “Driessen and McDonald highlight” – not highlights Line 16: predating Line 16: Given that the earthquake occurred [. . .], this event is consistent [. . .], and maybe initiated the observed. . . Line 20: [. . .] example is the most recent eruption of [. . .] – not the recent Line 24: Should figure 2 and 3 be swapped in order to mention the figures in the correct order (first Fig. 1, then Fig. 2, . . .)? Page 818, line 1: “180 km east” – not East

## 3 Strain partitioning and observed focal mechanisms in the arc

Line 5: “slip on the subduction interface” Line 6: “Figure 2 shows the tectonic setting, the slip distributions, and the direction of the. . .” Line 15: “Chemenda et al. (2000) highlight” – not highlights Line 18: “[. . .] is partitioned and where strike-slip faulting occurs in the arc (Fig. 3).” Line 20: “[. . .] because of the frontal collision. However, some strike-slip faulting. . .”

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## 4 Coulomb stress transfer to the arc

Line 14: “We only account for the focal mechanism of events. . .” Line 16: “we are only concerned. . .”

### 4.1 Sumatra

Line 6: “promotes an increase of the permeability and the upwelling of deep fluids that further reduce the. . .” Line 8: “Based on this, we would expect additional events with strike-slip focal mechanism to occur within the next years as post-seismic” (We can’t predict events (yet), as a prediction implies the exact knowledge of the time, location and magnitude of an event)

### 4.2 Chile

Line 12: “M8.8 2010 Maule earthquake is located north of the. . .” Line 15: “north of” – not North of Line 21: “The results in Figure 5 refer to the fault plane. . .” Line 22: “antithetic fault plane (Figure 7). . .” Line 27: “shows increased shear and reduced normal stresses where. . .”

### 4.3 Japan

Line 5: “Pacific Plate”, “Eurasian Plate” Line 11: “the strike-slip focal mechanisms of the earthquakes that immediately followed the Tohoku earthquake are located in [. . .] with respect to the Eurasian Plate.” Line 13: “(blue circles in Figure 3c)”, it would help to add a, b, c to the Figure. Line 18: “from the slip of the”

## 5 Discussion

Page 822, line 3: “earthquakes” – not earthquake Line 16: “Plates” – not plates Line 20: “indicates” – not points to Line 21: “does not exist” instead of “does not occur”? Line 28: “to the north of” – not to the North of Page 823, line 4: “in Japan” – not on Japan Line 4: Great Sumatran Fault Line 6: “towards the north” Line 12: “Such sub-parallel structures to the compressional component [. . .] are comparable to the

regional-scale . . . Similar structures have also been identified in North Fiji, . . .” Line 17: “Cembrano and Lara (2009) highlight. . .” Line 21: “their reactivation would be the” – not is the Line 22: “According to this, shear stress” Page 824, line 3: “Strike-slip faulting is initiated by stress transfer from a slip event on the subduction interface. Also, the post-seismic increase of crustal . . . promotes the development of this mechanism. The permeability. . .” Line 11: “normal and shear stresses” Line 12: “[. . .] mega-thrust slip. Such . . .” Line 17: “that may cause” – not causes Line 20-23: “[. . .] and hydrothermal systems, as well as in critically. . .” or “[. . .] and hydrothermal systems, especially in critically. . . (1999). They may also contribute to the formation. . .”

### Conclusion

Line 8: “ $\sigma_h = \sigma_2$ , the slip-induced. . .” Line 9: “stresses cause the vertical stress to adopt” Line 16: “[. . .] itself, the” – not then Line 17: “additionally favour” – not favours

Figure 1 - caption:

Line 2/3 of the captions: . . .encourages thrust faulting and sill development, but limits vertical fluid flow

Last sentence: “[. . .], which coupled with the concomitant increase in hydraulic properties of the flow network, facilitates magma mobilization.” This is an implication which is not shown in the figure. Maybe this should rather be mentioned in the text than in the figure caption.

Figure 2:

Adding titles to the maps (e.g. Sumatra, Chile, Japan or “a” “b” “c”) would improve the clearness of the figure and the caption.

Also, in the caption one of the earthquakes in Sumatra on September 12, 2007 is characterized by M8.5 (line 6), which is not concise with M8.4 stated in the figure.

Figure 3:

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This figure is mentioned in line 24 in the text, before figure 2 is mentioned. Maybe one should change the order.

Again, it'd be helpful to add a, b, c (or titles) to the figure and caption for ease of identifying what the authors are discussing.

Caption, Line 7: “online” – not on-line.

Figure 4 - caption: Line 2: shear stress, normal stress, and coulomb stress Line 5: “event that occurred” – not event occurred

Fig. 5 and Fig. 6 - caption:

Line 3 and last sentence, respectively: “event that occurred” – not event occurred

Fig. 7 - caption:

Line 2: “event that occurred” – not event occurred Line 3: “The depth” – not Depth Line 4: “Fig. 5 are” – not Fig. 5are Line 5: “[. . .] planes. This implies that the Maule. . .”

Fig. 8: Nice illustration and summary.

Caption, Line 3: “Notice that  $\sigma_H$  and  $\sigma_h$  reduce, while  $\sigma_v$  remains unchanged.”

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Interactive comment on Solid Earth Discuss., 5, 811, 2013.

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