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Comment

Interactive comment on “Tsunami hazard in La Réunion island from numerical modeling of historical events” by E. Quentel et al.

E. Quentel et al.

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Dear reviewer,

You will find below the answers to your questions and comments. We improved the manuscript in modified the introduction and the subject. We corrected the source parameters for the 1833 event. We added for this a study on the source parameters in testing three different possibilities.

Thank you for your comments.

The authors.

Reviewer 1

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Specific comments:

Page 1825 – Line 3: Krakatau 1883 is a volcanic event, it can be misleading for the reader; I suggest discussing only tsunamigenic seismic events.

Answer: Krakatau reference has been deleted to talk about tsunamigenic seismic events only.

P1825 – L24: The authors introduce suddenly the 1833 and 1945 events that are not listed before, and rule out the 1907, 2005, 2007, 2010 Sumatra earthquakes. The authors should well explain the reason for this selection, the Magnitude as criterion of choice is not sufficient (e.g. Mentawai 2010 is M7.7 and Mentawai 2007 is M8.4).

Answer: We choose the largest tsunamigenic seismic event for each studied section of the subduction zones in Indian Ocean. The introduction of 1833 and 1945 events are more described.

The source of the 1833 event described in Zachariassen et al. (1999) has been corrected in the paper. We use 3 different sources to discuss about parameters. The first source of 1833 is the source of Zachariassen et al. (1999). The second source uses a rigidity of 30GPa against 50GPa for the first and the third. The slip is increased: 21,35m. For the third source, the Length of the geometry is decreased from 550 to 280 km in agreement with Natawidjaja et al. (2006).

P1827 – L19: Sahal et al. (2010) compiled a catalogue of tsunami for New Caledonia; please remove or correct this reference.

Answer: The reference to the catalogue of tsunami for New Caledonia of Sahal et al. (2010) has been deleted

P1828 – L1: The authors should explain the reason to select these seismic events, or if they decide to include other earthquakes in their study then they have modify the sentence opportunely.

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Answer: We focus on four major historical subduction earthquakes, the 1833 and 2004 Sumatra, the 2006 Java, and the 1945 Makran events. These tsunamigenic events are on different subduction zones in a straight line of the Mascarene plateau and the island of La Réunion. In addition, except the 1945 event, each have caused significant tsunamis on these areas. The magnitude of the earthquake in 1945 and the local impact of the tsunami on neighboring regions justifies its inclusion in this study.

P1828 – L7: Position and depth of the 1833 event are different from those in Table 1.

Answer: For the 1833 event, position in the text has been corrected with the position indicated in the Table 1.

P1829 – L13: Why the 2010 Mentawai event is mentioned if it is not modelled? Why this event is not modelled (even if it produced many damages)?

Answer: Delete of the mention of 2010 event in the description of 2004 event. 2010 event is not modeled due to its “minor” impacts in comparison with 2004 event where we have more data.

P1830 – L16: It could be useful for the reader plotting the tsunami travel times in Figure2 for each of the tsunami simulated.

Answer: The tsunami travel times have been added to figures in Figure 2 and 3 for each tsunami.

P1831 – L19: The authors here describe water heights (5 meters) observed a La Réunion ensuing the 1833 tsunami, but in paragraph 3.1 they write that there are not tsunami observations associated to this event. Please, correct or better explain.

Answer: No water heights in 1833 have been registered. Reference to 5 meters deleted. It was a mistake between observation and simulation.

P1832 – L4: Please, cite opportunely the Litto3D project.

Answer: The literature reference for The Litto3D project has been added.

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P1838 – L4: The last sentence in paragraph “Discussion” sounds incomplete; probably the authors should better develop it.

Answer: The last sentence has been changed.

P1838 – L6: The authors cite the 2010 event without modelling it, is misleading for the reader.

Answer: Citation removed.

P1838 – L9: The authors affirm to model great historical events, but Sumatra 2004 and Java 2006 occurred less than 10 years ago. Furthermore, they cannot affirm to have fulfilled the gap in the lack of information on tsunami hazard on La Réunion by considering only 4 events.

Answer: We selected events on each major subduction zones on Sunda arc: 2004 (north of Sumatra), 1833 (south of Sumatra) and 2006 (Java, south of arc). Historically, only these events have produced significant impact on Mascarene plateau and La Réunion. The last one was 2010 event but the magnitude is Mw7.7 less than the 1833 event located on the same zone. There were only four events to impact Mascarene plateau. No other information were available. To go further, a parametric study of source on all subduction zones could be answer to the lack of information.

P1838 – L16: The seismic source by Hébert et al. (2007) is not simple (6 subfaults with variable geometry), this source is simpler than the one presented in Sladen and Hébert (2008).

Answer: The sentence has been removed.

P1839 – L8: I did not understand the last 6 rows of the manuscript. Please, correct them.

Answer: These sentences have been corrected. (typo mistakes)

P1843 – Table1: Why the authors use a rigidity values equal to 20 GPa? They use

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the source of Hébert et al. (2007) and Sladen and Hébert (2008) that use 45 and 40 GPa respectively for approximately the same zone. In addition, Zachariassen et al. (1999) use 50 GPa in their study. So, by conserving the seismic moment, if the rigidity increases then the slip should consequently decrease, and even the tsunami impact on La Réunion would be different. Please, discuss this point.

Answer: We corrected the rigidity value and computation. Moreover, we improved our study in using 3 different source parameters for 1833 event. The first source of 1833 uses the rigidity of 50GPa and a fracture length of 550 km as described by Zachariassen et al. (1999). The second source uses a rigidity of 30GPa against 50GPa for the first and the third. The slip is increased: 21,35m. For the third source, the Length of the fracture is decreased from 550 to 280 km in agreement with Natawidjaja et al. (2006).

Technical Corrections have been done following the remarks.

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