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Interactive comment on "Structure of the Central Sumatran Subduction Zone Revealed by Local Earthquake Travel Time Tomography Using Amphibious Data" *by* Dietrich Lange et al.

Anonymous Referee #2

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This is an excellent study of the velocity structure of a significant section of the Sumatran subduction zone including a transition from strong to low coupling. The inclusion of offshore and onshore seismic stations provides good imaging capability, and the tomography is carried out in a careful manner to produce reliable results. They show basins and variation in the lower crustal structure of the overlying plate.

Specific comments focus on aspects of the interpretation:

1. P 2 geodetic discussion. Add more discussion of Chlieh 2008 heterogeneous coupling, including some simple line (maybe 0.4 coupling) on Figures 1-2. Then the 3D velocity for the upper plate can be compared to coupling heterogeneity, which varies

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Discussion paper

from 0 to 1 in the study area.

2. P14, L13-14 Add more discussion and consideration of the process of accretion, and how the IFZ and other fracture zones could influence. With the difference in angle between the IFZ and the trench-megathrust, and the partitioned slip, it seems that for a specific forearc plate-interface depth, the location of the IFZ would move southeast with time as the subducted plate descends, and thus could create margin-parallel accreted features.

3. P14, L18-24 and conclusions. High-velocity feature d (Fig 10) is interesting in that it seems correlated with the region of low coupling. The 3D Vp shows that it is a spatially distinct feature. Is there actually some localized process of crustal thinning at that location? Since the forearc crust is considered to be assembled through accretion, it seems more likely that it is mafic block that has been accreted.

4. P18 and conclusions, Vp/Vs. If the high Vp/Vs is related to the Mentawai fault back-thrust, then it might be a zone of releasing and transporting subduction fluid into and through the upper plate crust. If the crust is permeable, then the subduction fluid would not be trapped in the mantle wedge corner and thus the lack of serpentinization.

Technical corrections:

5. P2, L20 change ‘is undebated’ to ‘unabated’

6. P2, L27-29. Add specific depths for the Moho summary.

7. Figure 1. Green for Mentawai is poor color choice because same as land. Add box for area of Figures 2, 9

8. P4, L20. Change ‘targets’ to ‘target’

9. Figure 4 caption, P11 L16, and elsewhere. Put in the specific spread cutoff value.

10. P10, L2. Remove ‘(Fig. 5)’ which is not the checkerboard.

11. Figure 9. Make this bigger so that it takes up the full page. It is too hard to see.

12. Figure 10. Use the same Vp color scale for this and for Figure 5 so that readers can compare. Mark the Mentawai fault.

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