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Modeling of ground motions and stress transfer caused by the December 26, 2004 Sumatra earthquake

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On December 26^{th} 2004, a devastating earthquake of M=9 occurred offshore Northern Sumatra. Due to the size of this earthquake and the accompanying tsunami wave, disastrous consequences have been observed at several countries around the Indian Ocean with a total death toll of more than 200 000. The tectonics in the region are characterized by the oblique, NNE oriented subduction of the Australian and Indian plates under the Sunda microplate with a rate of 6-6.5 cm/yr. This oblique convergence results in strain partitioning, where the trench perpendicular thrust faulting along the subducting slab accommodates the E-W component of the motion, whereas the N-S component of the motion is probably accommodated by the right-lateral strike slip faulting along the Great Sumatran Fault which passes along the western part of the main Sumatra island parallel to the volcanic chain. Source parameters of the December 26^{th} 2004 event have been used for modelling the resulting ground motions in the nearby affected regions. This will give information about the importance of ground shaking in the total destruction of places like Banda Aceh, Northern Sumatra, Indonesia. The modeling is performed for a multi-asperity finite fault using a hybrid procedure combining deterministic modeling at low frequencies and semi-stochastic modeling at high frequencies. In addition, stress transfer is modeled to estimate the resulting stress distribution and give an insight to the issues of future earthquakes along the neighboring segments of the subducting slab or along strike-slip faults on mainland Sumatra.