



The Great Sumatran Duplex as Revealed by Local Seismicity

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The combination of the Sunda megathrust and Great Sumatran Fault (SF) represents a type example of slip-partitioning. However, superimposed on the SF are geometrical irregularities, which would disrupt the strain field. The most spectacular such feature is the 35 km wide equatorial bifurcation. A dense local network was installed along a 350km section around this bifurcation, registering 1016 crustal events between April 2008 and February 2009. 528 of these events are assigned highly accurate locations through application of the hypoDD double-difference relative relocation method. The hypocentres reveal several new features about the SF fault. Away from the bifurcation, seismicity is strongly focused on the known surface trace of the fault, notably the aftershocks of the Mw 6.0 earthquake of 19/05/2008. By contrast intense seismicity is observed within the bifurcation, off the known fault trace. En-echelon streaks of seismicity align with topography that bisects the bifurcation, indicating that it could be an unrecognised strike-slip duplex structure. Cross-sections image multiple dipping horizons and V-structures, suggesting it is rooted in a flower structure. Focal mechanisms indicate a disruption to the strain field in this region, implying dextral strain is accommodated on multiple oblique faults. The formation of the proposed duplex could be in response to the subduction of the Investigator Fracture Zone on the subducting plate. Only very sparse seismicity is found away from the main fault trace (and outside the bifurcation). The most prominent off-fault cluster is spatially linked to Gunung Malintang. This volcano is not listed as active, but shows morphology consistent with geologically recent activity, leading us to interpret the seismicity as indicating possible fluid movement.