3D numerical modelling of strain field around the Sumatra influenced by the coupling effect along subduction zone

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The Sumatra continental margin corresponds to a long subduction zone between the Sunda and the Indo-Australian plates. The continental margin has been studied through geological and geophysical observations to the evolution of Benioff Zones and accretionary wedge, which is characterized by occurrence of strong earthquake, high fault slipping rate and strain partitioning within Sumatra arc. there has been lots of opinions to explain these phenomenons, but still to lack direct proof. Especially the effect of coupling along subduction zone is very important for understanding big earthquake and tsunami. We investigate five FEM models of coupling along subduction zone according to published observation data. The result are as followed : (1) by adjusting the coupling area of subduction zone, we find out that the value of strain intensity tends to increase with coupling area increasing. Meanwhile, the distribution of strain field of other areas can be affected by the accretion of strain intensity. Therefore, the overall Sumatra fore-arc appears to a clear segmentation of strain intensity, which corresponds to the rupture pattern of the Sumatra earthquake belt. (2) There is a difference between the principal strain directions in the northern and southern Sumatra, which derive from the interaction of subduction velocity, direction, configuration and coupling area among different regions of subduction zone. (3) Although the northern Sumatra is to be under a weak coupling condition according to our simulation result, there still exists a vertical negative displacement under an influence of subdution, this condition provides an environment to develop tsunami after earthquake.

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Os isotopes in Witwatersrand platinum-group alloys: Implications for ancient mantle melting events and the timing of gold formation

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The Os isotopic compositions of platinum-group element alloys (PGA) have been shown to retain a record of mantle depletion events, owing to their high Os content, low Re content and their resistance to alteration. As PGA form in platinum-group element-rich ultramafic rocks, PGA from alluvial systems can be used to trace the input from such rocks into mineralised sedimentary systems. In some circumstances, isochrons can be obtained from individual PGA grains [1].

The Witwatersrand supergroup is the largest recognised Archean sedimentary basin. It contains PGA of assumed detrital origin that can be used to constrain the age of potential ultramafic sources, which has implications for the source of gold, and secondly, to provide a window into ancient mantle melting events. $^{187}Os/^{188}Os$ ratios for the Wits PGA span a range from 0.1045 to 0.120, with a pronounced mode at 0.1053. However, much of the spread to radiogenic values is due to in-grown ^{187}Os, rather than heterogeneous source material. Two subsets of well-correlated data, give indistinguishable ages of 2713 ± 72 Ma and 2776 ± 79 Ma, with different initials of 0.10638 and 0.10506, respectively. These ages are somewhat younger, and the initial ratios somewhat lower, than Re-Os ages for gold from the Wits [2] Both initial ratios give sub-chondritic γOs values and hence older model ages of 3 Ga and 3.2 Ga.

PGA with minimal ^{187}Os ingrowth display significant isotopic heterogeneity (mostly 0.1045 to 0.108, but with outliers up to 0.116). Whether such a range reflects inputs from a variety of greenstone belts, or heterogeneity within a single greenstone belt is not clear, particularly in the light of data from other PGA suites derived from recent ophiolites which also display significant within-massif heterogeneity.

[1] Nowell *et al*. (2008) *Chem Geol*. **248**, 394–426. [2] Kirk *et al*. (2002) *Science* **297**, 1856–1858.