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Exploring the contrasts between fast and slow rifting

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Researchers are now finding that extension sometimes occurs at rates much faster than the mean rates observed in the development of passive margins. Examples of rapid and ultra-rapid extension are found in several locations in Eastern Indonesia. This includes in northern and central Sulawesi as well as in eastern- and westernmost New Guinea. The periods of extension are associated with sedimentary basin growth as well as phases of crustal melting and rapid uplift. This is recorded through seismic imagery of basins offshore Sulawesi and New Guinea as well as through new field studies of the onshore geology in these regions. A growing body of new geochronological and biostratigraphic data provide some control on the rates of processes, indicating that rates of extension are typically at least twice as fast and potentially an order of magnitude faster than the fastest rates applied for more commonly studied rift settings (e.g. Atlantic opening, East African Rift, Australia-Antarctica opening).

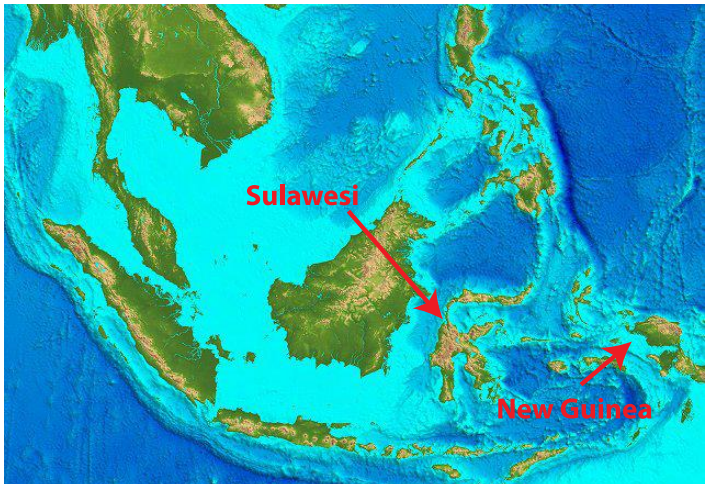

Figure 1: Bathymetry of South East Asia.

Here we explore a suite of experiments more appropriate for rifting episodes in Eastern Indonesia, and compare the evolution of these 'fast' (20-100 mm/year full rate) rifting models to experiments with the same crustal geometries rifting at ~5-20 mm/year. These extension episodes occurring in Eastern Indonesia take place under different thermal conditions (e.g. hot and thin crust in Sulawesi, colder conditions in New Guinea). Thus, we also investigate the role of the temperature field controlling the evolution of fast and slow rifting and partial melt production. In particular, we explore to what depths hot lower crust and mantle can be exhumed by fast rifting, and whether we can produce the p-T-t paths implied by recent onshore geological studies.