



Gravity against tectonics during continental break-up over a hot mantle

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One of the main features that distinguish volcanic (VPMs) from non-volcanic passive margins is that extension is accommodated by (syn-volcanic) continentward dipping faults in the former case and dominantly (syn-sedimentary) seaward-dipping faults in the second one. The pattern of fault organization within the brittle crust is primarily controlled by the sense of shearing at the brittle crust / ductile crust interface (if decoupled) or by the sense of flow within the lower crust during continental break-up. The sense of ductile flow within the ductile levels of the lithosphere is controlled by its tectonic stretching but also by the distribution of horizontal gravity forces consecutive to lateral variations of the lithostatic pressure at a given depth. Using both analytical and numerical approaches, we show that crust geometry at volcanic margins is certainly primarily controlled by the sudden upward and oceanward flow of the buoyant lower-lithosphere and asthenosphere at the time of continental break-up. The proposed break-up mechanism is deeply different from the one admitted at non-volcanic passive margins and may explain several other features of VPMs.