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Post-breakup topographic rejuvenation of passive margins is directly related to the architecture of hyperextension

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Post-breakup topographic rejuvenation of individual escarpment sectors atop passive continental margins has been documented for decades. In two recent publications we have identified and quantified a scaling relationship that links the width of a proximal margin sector to the absolute elevation of its seaward-facing escarpment. The scaling relationship appears to be valid, globally, on margin sectors where hyperextended crustal architecture is present offshore (see Osmundsen & Redfield, 2011). In a detailed test we have also documented clear correlations between the geomorphic characteristics of the Scandinavian hinterland backslope, its point of flexure against the Archean craton, today's seismicity, and the now-offshore Taper Break, or the point of deformation coupling/decoupling that was active during high-beta thinning (see Redfield & Osmundsen, 2013). In one particularly fine example the More og Trondelag Fault Complex is shown to have reactivated in accordance with a normal displacement gradient that in turn obeys a simple distance relationship with the Taper Break. These results demonstrate that the topographic fate of a passive margin is determined by the end of the rift phase, and is directly related to the pattern of large-magnitude extensional faults that created the crustal taper and decided the location of the Taper Break. Post-breakup and/or 'accommodation-phase' uplift at passive margins is the inexorable and penultimate phase of hyperextension and is independent of external factors such as mantle convection, lithoshpheric composition/delamination, glacial history, magmatic style, or far field stresses such as those postulated from 'ridge push' or changes in plate motion.

Osmundsen & Redfield, 2011, Terra Nova, 23, 349-361.
Redfield & Osmundsen, 2013, GSA Bulletin, 125, 184-200.