



Basin formation and hydrocarbon potential: the role of shear heating, tectonic pressure, differential thinning and rate of rifting

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Nature displays numerous examples of basin formation and inversion that cannot be explained by simple rift and post-rift subsidence models. One example is the super-regional Base Cretaceous Unconformity, mapped on-land East Greenland and most of the Norwegian continental shelf. This uplift and erosion unconformity matches a major phase of continental extension, a time for which standard models predict major subsidence. These models attribute surface displacement to tectonic events and thermal contraction. Here we present numerical simulations to quantify the influence of several mechanisms during lithospheric thinning. Mineral phase transitions within the lithosphere, differential thinning of the lithosphere, and rates of sedimentation may subdue syn-rift subsidence and increase post-rift subsidence. We demonstrate that shear heating and tectonic pressure may dramatically shift predictions of basin evolution and lead to syn-extensional uplift and more pronounced post-extensional subsidence. Evidently our understanding, and even apparent observation of structural events (e.g. rifting), and particularly their timing, is intimately linked to our concepts of the involved processes.