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Extension style in the Orphan Basin during the Mesozoic North Atlantic rifting

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The Orphan Basin, lying along the Newfoundland passive continental margin, has formed in Mesozoic time during the opening of the North Atlantic Ocean and the breakup of Iberia/Eurasia from North America.
Regional deep seismic reflection profiles across the basin indicate that the Neoproterozoic basement has been affected by repeated extensional episodes between the Late Triassic/Jurassic and the Early Cretaceous. Deformation initiated in the eastern part of the Orphan basin in the Jurassic and migrated toward the west in the Early Cretaceous, resulting in numerous rift structures filled with Jurassic-Lower Cretaceous syn-rift successions and sealed by thick Upper Cretaceous-Cenozoic post-rift sediments. The seismic data show an extremely attenuated crust underneath the eastern and western part of the deep basin, forming two sub-basins associated with the development of rifting. The two sub-basins are separated by a wide structural high with a relatively thick crust and are bounded to the west by the continental shelf domain.
Restoration of the Orphan Basin along a 2D crustal section (520 km long), yields a total amount of stretching of about 144 km, while the total crustal thinning indicates an extension of around 250 km, assuming mass conservation along the section and an initial crustal thickness of 28 km. Brittle deformation accommodated by normal faults is documented in the seismic profiles and affected essentially the present-day upper portion of the crust, and represents only 60% of the total extension which thinned the Orphan crust. The remaining crustal thinning must involve other deformation processes which are not (easily) recognizable in the seismic data.
We propose two models that could explain discrepancies between brittle deformation and total crustal thinning during lithospheric extension. The first model assumes the reactivation of pre-rift inherited structures, which act as crustal-scale detachments during the early stages of rifting. The second model uses depth-dependent extension of a 20 km thick crust characterized by a strong upper crust and a weak lower crust. Both models raise secondary issues that are discussed around the order of rifting events and the original crustal thickness.