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Large-scale tectonic inheritance in the North Atlantic region

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The Northeast Atlantic, defined here as extending from the Charlie Gibbs Fracture Zone to the north Norway-Greenland-Svalbard margins, is often regarded as a classic case of inheritance and the Wilson-cycle concept. We examined different aspects of tectonic inheritance in the Circum-North Atlantic region (CNAR): 1) as a function of rejuvenation at different scales, ranging from lithospheric to local, and 2) in terms of development of the ocean and its margins through time. This includes the role of fundamental lithospheric structures such as orogenic belts, mantle fabrics and composition, major strike-slip faults and lower crustal inhomogeneities in Northeast Atlantic breakup. We relate these to the development and shaping of its continental rifted margins, localisation of magmatism, and microcontinent release. Although inheritance is common at multiple scales, the Wilson Cycle does not apply to the CNAR everywhere. The observations from the North Atlantic suggest a depth dependency in rheological inheritance (surface, crust, mantle) that was selectively reactivated depending on time-scales, stress field orientations and thermal regime. Specifically, post-Caledonian reactivation to form the North Atlantic rift systems essentially followed the orogenic fabric, while eventual break-up required a change in the stress field and exploitation of a deeper-seated, lithospheric-scale shear fabric. We infer that, although collapse of an orogenic belt and eventual transition to a new ocean does occur, it is by no means an inevitability, and that the general concept of cyclicity needs to be re-assessed.