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Deep structure of the Atlantic margins and neighboring oceanic crust from wide-angle seismic data and plate kinematic reconstructions.

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In order to study opening mechanisms and their variation in the Atlantic ocean basins, we compiled existing wide-angle and deep seismic data along conjugate margins and performed plate tectonic reconstructions of the original opening geometries to define conjugate margin pairs. A total of 23 published wide-angle seismic profiles from the different margins of the Atlantic basin were digitized, and reconstructions at break-up and during early stages of opening were performed. Main objectives were to understand how magma-rich and magma-poor margins develop and to define more precisely the role of geologic inheritance (i.e., preexisting structures) in the break-up phase. At magma-poor margins, a phase of tectonic opening without accretion of a typical oceanic crust often follows initial rupture, leading to exhumation of serpentinized upper mantle material. Along volcanic margins the first oceanic crust can be overthickened, and both over- and underlain by volcanic products. The first proto-oceanic crust is often accreted at slow to very slow rates, and is thus of varied thickness, mantle content and volcanic overprint. Accretion of oceanic crust at slow to very slow spreading rates can also be highly asymmetric, so the proto oceanic crust at each side of conjugate margin pairs can differ. Another major aim of this study was to understand the mechanisms of formation and origins of transform marginal plateaus. These are bathymetric highs located at the border of two ocean basins of different ages and are mostly characterized by one or several volcanic phase during their formation. They often form

conjugate pairs along a transform margin as it evolves and might have been the last land bridges during breakup, thereby influencing mammal migration and proto-oceanic currents in very young basins. At these plateaus, volcanic eruptions can lead to deposits of (at least in part subaerial) lava flows several km thick, better known by their geophysical signature as seaward dipping reflectors. Continental crust, if present, is heavily modified by volcanic intrusions. These marginal plateaus might form when rifting stops at barriers introduced by the transform margin, leading to the accumulation of heat in the mantle and increased volcanism directly before or after the cessation of rifting.