

Lithosphere dispersal and mantle flow across plate boundaries after continental break-up

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The episodic cycle of supercontinent assembly and break-up is linked to the formation of new oceanic lithosphere (rifting/driftng), subduction, collision and eventual continental growth or decline. Reports on the presence of an ancient lithospheric fragment beneath Hispaniola and of inherited zircon grains in the intra-oceanic arc and upper mantle rocks of Cuba and Hispaniola record this cycle. Moreover, these findings argue in favour of the fundamental roles that supercontinent break-up, ridge subduction, and mantle flow across slab edges/tears play in transferring matter across plate boundaries. These data, combined with regional geodynamic considerations and thermomechanical numerical experiments, allow the development of a general tectonic model that supports large-scale geodynamic processes in the mantle related to the break-up of Pangea. Here we show that subduction of the proto-Caribbean spreading ridge generated a mantle window through which toroidal mantle flow transferred part of the Atlantic mantle to the Pacific.