Evolution of Passive Continental Margins

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Passive continental margins have been classically viewed as evolving primarily from rifting processes such as uplift, stretching and thinning of the continents during their break-up and subsequent subsidence as the continent edges cool as they migrate from the new mid-ocean ridge system. Geophysical measurements as well as deep core samples now indicate that there are two primary types of rifted passive margins – a 'volcanic' rifted margin and a 'non-volcanic' rifted margin. The volcanic rifted margin is associated with voluminous magmatism. Sequences of seaward dipping seismic reflectors observed on deep multi-channel seismic reflection profiles are often characteristic of 'volcanic' rifted margins.

In this paper, the available geological/geophysical data is reviewed and examined on a global scale. Concepts relating to the earliest rifting history and separation of the continents are discussed as they have been historically developed. These include records of rifting of the continental lithosphere, the early formation of ocean crust, the determination of the boundary between oceanic and continental basement and the subsidence history of the margins. Particular attention is given to areas where deep ocean drilling has yielded significant results with respect to margin evolution. These include the 'non-volcanic' margins of west Iberia, a sediment starved margin where continental rift structures control the present day morphology. Drilling here has recovered the pre- syn- and post-rift sediments overlying continental basement composed of mafic rocks as well as serpentinized peridotites on a basement ridge which appears to mark the ocean-continent boundary. Also discussed are margins of the Voring Plateau off Norway and the East Greenland margin where drilling recovered post-rift sediments and the volcanic basement of the seaward dipping reflector sequence.