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Imaging first steps of seafloor spreading and its relationship with the intermediate domain: the role of the lower continental crust

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The transition between the so-called intermediate domain and the first supposed oceanic crust is still a matter of debate in many if not all passive margins. In many cases, the nature of the intermediaite domain, after a more or less sharp continental necking zone, is also a subject of discussion. On an other hand, the exact boundary of the first true oceanic crust can be hard to define; in some places, as in the western and eastern Mediteranean sea, several different systems which have produced this first oceanic crust are proposed with opposite spreading directions.

We present here a compilation of several wide-angle seismic experiments conducted by Ifremer since twenty years with its academic and industrial parterns in the Mediteranean sea (Provençal Basin), the Central Atlantic (Morocco margins), the Equatorial Atlantic (Berrenhinhas-Maranão-Ceara Margins), the Central segment of the South Atlantic (Angola Margin, Santos Basin) and the Indian (Mozambique margins) oceans. Forward modeling of the wide-angle seismic profiles acquired at sea and on land during these experiments reveals a evolution from the necking continental zone to the true (but usually thin) oceanic crust, with a domain of exhumed material, most generally exhumed lower continental crust, and the existence of a proto-oceanic crust. These results point out the crucial role of the lower continental crust in the thinning process as well as its probable involvement in the first proto–oceanic crust as proposed Aslanian et al. (2009) following the early proposition of Bott (1971).