Volcanic Margins: Another Way to Break the Lithosphere?

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Volcanic margins represent >50% of the world's passive margins and could content large quantities of hydrocarbons. The issues with the exploration and exploitation of such margins are technical (sediments are usually covered with thick lavas and tuffs) but also, and primarily, conceptual. No general agreement indeed exists on what is a volcanic margin, how it develops, and what truly distinguish it from sedimentary-types at crustal and lithospheric scales. Recent knowledge at non-volcanic margins (especially their distal part) comes from the powerful confrontation of marine geophysical data with direct geological observations. These geological observations not only come from ocean coring but also from inverted margins in orogenic belts. New concepts have been developed from this approach, such as continuity of processes during the ultimate stretching of the continental lithosphere with the oceanic accretion stage. In the case of volcanic margins, we don't have access to the knowledge of the deep structure of volcanic margins. No inverted volcanic margins have yet been recognized in orogenic belts, which could unmask their deep crustal structure. This notably results in the poor constraining of inverted geophysical data. However, accurate and key observations on the upper-crust structure of non-inverted eroded volcanic margins can be performed onshore in the NE-Atlantic. These observations can be mixed with others from Iceland, which represents the particular accretion stage that follows continental breakup in magma-rich environments. As for non-volcanic margins, confrontation of these high-resolution geological data with available seismic data is a powerful way to understand the mechanics of plate breakup until oceanic accretion. As evidenced by a step by step comparison of processes, these mechanics seem quite different at volcanic margins compared to non-volcanic margins.