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3D geometry and growth of Volcanic Passive Margins: some striking features and related problems

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Volcanic passive margins distinguish from non-volcanic ones from a number of striking features that are summarized in the following table and some of which being illustrated using tectonic, magnetic, Ar-Ar and fission-track data recently gathered by our research group along the Greenland VPMs.

		Volcanic passive rifts and margins			Non-volcanic passive rifts and margins		
LITHOSPHERE	Volume changes	$\Delta V > 0$ accretionary margins			$\Delta V = 0$		
	Vertical displacements	AR	SR	PR	AR	SR	PR
		↑	0?	↓		↓	↓
	2D profile	“Hyper-Necking”			Necking		
ϵ	Very high (>> 10 ⁻¹⁴ s ⁻¹ ?)			Low to moderate (10 ⁻¹⁶ /10 ⁻¹⁵ s ⁻¹)			
Upper crust	2D across-strike profile	Seaward-dipping crustal flexures accommodated by continentward-dipping syn-magmatic detachments			Rotated crustal blocks associated with major seaward-dipping normal faults with decrease of dip at the brittle-ductile transition		
	Along-strike segmentation	Both magmatic and tectonic Various wavelengths Controlled by melting zone areas in the mantle			Larger wavelengths, well-identified accommodation zones between asymmetric rift segments		
ASTHENO-SPHERE	T	ABNORMAL			Infra-solidus		
	Mantle flux	Probably active upwelling through small-scale diapirism			Passive upwelling		

AR: Ante rift, SR: Syn rift, PR: Post rift

We shall specifically argue the following points that, obviously, could have some consequences in the topic of the research of hydrocarbon habitat at VPMS:

- 1) the 3D tectonic and thermal structure of VPMS are certainly closely linked to active asthenospheric mantle processes;
- 2) lithospheric break-up at VPMS seems fundamentally an inhomogeneous and unstable process; it would initiate and propagate from specific lithospheric **soft-points** that are directly linked to melting zone areas in the mantle.

We point out that the interaction between the mantle and the lithosphere at VPMS could in some way, be compared to the one observed at slow-spreading ridges.

We outline that one of the major remnant problem concerning VPMS is the understanding of the *stability* in time and space of the areas where rifting initiates.