Seafloor giant polygons associated with underlying polygonal faults in the Caribbean Sea, west of Grenada Basin
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To cite this version:

HAL Id: hal-02384501
https://hal.archives-ouvertes.fr/hal-02384501
Submitted on 28 Nov 2019
2 - SIMILARITIES

Two processes involved in the development of polygonal faults include syneresis of colloidal sediments (Dewhurst et al., 1992) and faulting controlled by residual shear strength and low coefficients of friction (Goulty, 2001). Syneresis is a process of spontaneous contraction and thinning of colloidal gels (Dewhurst et al., 1992) that leads to crustal thinning in unfaulted areas (Clausen et al., 1993). Residual shear strength affects the formation of polygonal fault systems in the northern Bay of Biscay, in the Rockall Trough in Ireland, or in the Vema Basin on the Norwegian continental margin. All of these basins are characterized by a similar sedimentary environment suggesting that the polygonal fault systems could have formed through equivalent processes.

3 - PROCESSES

Polygonal fault systems developed in the development of polygonal faults include syneresis of colloidal sediments (Dewhurst et al., 1992). Fragile plastic sediments, controlled by density instabilities and gravity collapse (Mathieu et al., 2000), and faulting controlled by residual shear strength and low coefficients of friction (Bralchy, 2001) are processes of spontaneous contraction and thinning of colloidal gels (Dewhurst et al., 1992) that leads to crustal thinning. Residual shear strength is a significant parameter that controls the formation of polygonal fault systems in the northern Bay of Biscay, in the Rockall Trough in Ireland, or in the Vema Basin on the Norwegian continental margin. All of these basins are characterized by a similar sedimentary environment suggesting that the polygonal fault systems could have formed through equivalent processes.

4 - CONCLUSIONS

Regional analysis of seismic data at a basin scale provides new insights on the evolution of polygonal fault systems. In the northern part, west of Guadeloupe, the seabed polygons are much wider by a factor of 10 to 20% (Figure 2A), suggesting that the size of polygons depends on the location within the basin (Figure 2B). In the area, the polygonal faults are separated by sedimentary horizons and are aligned in a W-E orientation (Figure 2B). This process occurs right beneath the seabed creating large hyperbolae. This could be due to hydrocarbon-rich fluids, most probably methane, feeding benthic organisms such as bacteria responsible for in situ carbonate precipitation. A seismic profile displays at the exact same horizontal scale shows that each depression is bounded by faults reaching the seabed (Figure 2B). This process will go on as long as the seabed is covered by accumulations of sediment (Oehler et al., 2012). Such fault systems have been recognized in many basins all over the world (Clausen et al., 1993; Clau- sen and Faleide, 1994; Lav溘er et al., 1998; Drozdz et al., 2000; Shin et al., 2001; D. Rodolfo et al., 2002; J.A. Korstgård, J. of Str. Geology 15 (1993); J.A. Cartwright, L. Lonergan, Mar. and Petr. Geology 16 (1999); A. Gay, C. Baudon, C. Berndt, R. Soliva, S. Planke, R. Mour, A. Gnest, M.T. Iremann, A. Gay, C. Baudon, C. Berndt, R. Soliva, S. Planke, R. Mour, A. Gnest, M.T. Iremann, Bull. of the Geological Society of China, 2011; J.C. Santamarina, J.A. Cartwright, JGR 115(B7) (2010); Q. Inverarity, J. R. of Geology 157 (2000).