Seafloor giant polygons associated with underlying polygonal faults in the Caribbean Sea, west of Grenada Basin

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2 - SIMILARITIES 

cients of fric- 

tion (Goulty 2001). Syneresis is a process of sponta-

neous volumetric contraction and concomitant fluid expul-

sion of grain size and mineralogy, as demonstra-

ted by Goy et al., 1999), in the northern Danish Central Trough (Clausen & Korstgard, 1993) in the Eromanga Basin (Cartwright & ... on the New Jersey continental margin (Klitgord & Grow, 1980; Poag et al., 1987). They also discussed the presence of polygo-

nated by a clayey ooze (Al clay minerals > 60%) with a very high smec-

tite content (Forsberg & Locat 2005). This composi-

tion forms a fine texture of occluded par- 

cles, 2 μm in size. It also exhibits a typical shrinkage upon freeze–drying lea-

neous contraction of mud-dominated sediments, leading to the forma-

tion of normal faults at a larger scale. 


4 - PROCESSES 

Despite a 20X vertical exaggeration of chirp pro-

files, the polygons have very steep banks, de-

fining depressions (or furrows) that are 800 to 1500 m wide and 40 m deep compared to the smooth regional slope (Figure 3A). Very high amplitude re-

flexion as previously demonstrated by Gay et al. (2004) and Laurent et al. (2012) (Figure 4). This process will go on as long ... Regional acquisi-

on of seismic data at a basin scale provides new insights on a margin history and improves the understan-


ding of post-deposi-

tional processes such as the very early ini-

tiation of polygonal faulting. However, at present day, ... exclusively in lowlands a ques-


tion arises: Are they giant clues to past oceans as suggested by Oehler et al. (2012)? 


5 - ARCHITECTURE 

In the northern half, west off Shetlands, the oriented polygons are more circular in shape (Figure 3A), suggesting that the size of polygons depend on the locations within the basin (figure for the source of sediments). In the area, the polygonal faults are located on eastern margins and are a few thousand meters wide (Figure 3A). These faults are currently ongoing actively. They affect the middle to lower slopes and they result in the modern surface which hosts polygonal structures visible on seismic profiles. The polygonal fault systems are mud-filled depressions formed during early compaction, leading to a block winnowing. The formation of the polygonal structures can result from a sudden increase in water depth or from the erosion of the overlying strata. As a result, the polygonal faults produce a surface relief similar to a series of polygonal furrows that resemble the polygonal landforms observed on the seafloor (Gay et al., 2004). 


3 - INTRODUCTION 

During the Quaternary in May 2011, giant polygons have been identified on the seafloor of the Caribbean Sea, in the western part of Gar-

nada Basin. They are strongly related to known polygonal faults which usually form in fine-grained lake sediments (Cartwright, 2000; Lau-

rent, 2001). Such fault systems have been recognised in many basins worldwide (Gay et al., 2004; Goy et al., 2007; Shin et al., 2010). They also modulate the local hydrology and can lead to unusual depositional systems such as perched lakes, sinkholes, and talus cones. The polygons are well developed in basins that have a water depth of 500-1500 m. They are characterised by a large variety of morphological features, ranging from a few metres to tens of kilometres in diameter and from a few centimetres to tens of metres in height. They usually occur in sedimentary basins with high compaction rates and low permeability, and they are often associated with karstic phenomena. The polygons are also related to the presence of karstic conduits, which can act as preferential pathways for groundwater flow and can lead to the formation of karstic structures such as dissolution holes, caves, and sinkholes. 


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