Polygonal Fault Orientations Disrupted by Underlying Turbidite Channels on the Mauritanian Margin

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Layer-bound polygonal faults are a class of non-tectonic faults which are a distinctive feature of fine-grained successions in sedimentary basin fills. Here we describe disruptions to the usual planform geometry of polygonal fault systems within the Neogene succession on the Mauritanian Margin, offshore West Africa, in places where the faulted sequences overlie turbidite channels which are up to 5 km wide. These turbidite channels are a major petroleum play, and an understanding of the faulting regime in the overburden may have important implications for seal integrity. Polygonal fault systems in the overlying sequences extend over an area of more than 2,000 km^2. Above each channel, the fault traces on stratigraphic horizons do not form the usual polygonal patterns but are strongly aligned perpendicular to the channel axis, and the great majority of the faults dip in the up-slope direction. Above the margins of each channel, there are typically sets of three or four channel-bounding faults which strike parallel to the channel axis and dip toward the channel axis. It is interesting to note that, due to the drape of the faulted succession across the turbidite deposits, these channel-bounding faults also dip in the local up-slope direction. Stewart and Argent (2000, J. Struct. Geol. 22, 693-791) noted that arrays of extensional faults are commonly dominated by a single fault vergence, forming 'domino' blocks. Furthermore, they noted that synthetic extensional faults in such arrays (i.e., faults that dip in the down-slope direction assuming overall shear is induced by gravity gliding) branch on to a basal detachment, as required kinematically. Antithetic extensional faults in such arrays pin out downward, without any basal detachment, as observed here. Although there is no overall horizontal extension within the sequences containing these layer-bound polygonal fault systems, the kinematic reasoning of Stewart and Argent remains valid, and we have tested their hypothesis by mapping the dip of stratigraphic horizons over these turbidite channels. Initial results confirm the correlation between preferential orientations of antithetic faults with the stratigraphic dip.