Geophysical Research Abstracts
Vol. 21, EGU2019-12748, 2019
EGU General Assembly 2019

Growth and interactions of overlapping faults: insights into strike-slip and dip-slip displacement relationships

Ioannis Zervas, Nicolas Waldmann, and Yizhaq Makovsky
Department of Marine Geosciences, Charney School of Marine Sciences, University of Haifa, Israel

Studies of strike-slip faults growth and interaction in nature are limited by the difficulty of evaluating the horizontal displacement for individual fault segments. This study examines the evolution of two strike-slip dominated overlapping faults, F1 and F2, in the Levant Basin. The faults are formed within the post-Messinian finely layered siliciclastic sediments, and are detached by the underlying Evaporitic Messinian deposits. Analyzing a high quality 3D seismic dataset, we estimated the strike-slip component of the faults' displacement by measuring the offsets of consecutive piercing points within buried avulsed submarine channels that cross the fault. These measurements are aided by seismic attribute analysis and spectral decomposition, which allowed differentiating subunits deposited within the channels during their avulsion. These subunits constitute the successive piercing points which are used to estimate the offsets. A map of the dip-slip displacements across and along the entire fault plane is constructed by measuring offsets of multiple interpretation horizons cut by the fault. We find a linear relation between the dip-slip and strike-slip displacements evaluated across the channel piercing points. This, result affirms that the two components are concurrent, and that the dip-slip maps can be used as a proxy for the total slip across the fault plane and reflect the fault growth evolution. Applying this rational to both faults F1 and F2 reveals that slip along these faults is segmented, and that there is linkage between the segment nodes of the two faults. The majority of the segments evolve as blind faults that display radial propagation. Segment complexity is increased near above the top Evaporitic surface with asymmetric displacement contours, suggesting an upward propagation. F1 and F2 have an overlap zone, which is deformed progressively by a sigmoidal duplex in the deeper part, while the shallower remained intact. Paleo-tips of the fault segments could represent points of minor fault initiation and duplex development. Our study thus shows that dip-slip versus strike-slip displacement relationships can be a used to asses fault growth of such genetically related faults in which slip of both components occurs simultaneously. Additionally, it could provide changes of the fault type from strike-slip to dip-slip dominated for linked fault segments and vice versa.