Geophysical Research Abstracts
Vol. 19, EGU2017-539, 2017
EGU General Assembly 2017

Complex deformation associated with anhydrite layers in the Tromsø Basin, SW Barents Sea.

George Marfo (1), Kamaldeen Olakunle Omosanya (1), Ståle Emil Johansen (1), and Ioannis Zervas (2)

(1) Norwegian University of Science and Technology, Department of Petroleum Engineering and Applied Geophysics,Norwegian University of Science and Technology, Trondheim, Norway (georgem@alumni.ntnu.no), (2) 2Department of Geology and Mineral Resources Engineering, Norwegian University of Science and Technology, Trondheim, Norway. (zannzerv@gmail.com)

Internal and external deformation associated with salt structures is of prime interest due to their economic importance as hydrocarbon seals, reservoirs, repositories for chemical waste and their implication on drilling. Salt structures are often associated with anhydrites, which may 'cap' or are enclosed within the allochthonous salt structures. Despite their economic importance, the internal and external structures of evaporites remain poorly studied from field and seismic data due to the sparse outcrops of evaporites and poor seismic imaging. The zero-phased, normal polarity, high resolution multiple 2D seismic data, in combination with detailed interpretation of wireline logs provide an excellent study into the salt structures, and offers a good opportunity to investigate the dynamics, geometries and mechanisms driving deformation of internal and external salt layers associated with the Late Carboniferous to Early Permian Salt structures in the Tromsø Basin. The methods include seismic interpretation and the application of multiple seismic attributes to map stratigraphic units and discontinuities. Our results show that the anhydrite layers are marked by high amplitude reflections at the crests and flanks or fully enclosed within the salt diapirs. Crestal and lateral anhydrite caprocks represent external salt structures whilst the entrained anhydrites or stringers are intrasalt structures. Anhydrite caprocks generally show structural styles such as faults and large-scale folds which are harmonic to the top salt structure. In contrast, anhydrite stringers show folds of varying scale, which are harmonic to disharmonic to the top salt structure. Boudins and steeply dipping stringer fragments are also interpreted within the stringers. Caprock deformation is attributed to salt upwelling. Folding and boudinaging of originally horizontal and continuous stringer layers formed from a multiphase superimposed sequence of ductile and brittle deformation in response to complex multi-dimensional salt flow. Internal salt flow involves radial and tangential compression, which leads to dominant fold structures near the margins. Boudins on the lower flanks of the diapir formed due radial extension. Our study further demonstrates that differential geometries exhibited by the different anhydrite groups imply that the mechanisms deforming internal and external salt structures are different. The results from this study are comparable to observations from salt mines, field exposures, scaled physical and numerical models.