Geophysical Research Abstracts
Vol. 12, EGU2010-11990, 2010
EGU General Assembly 2010

Fault zone properties in carbonate rocks: insights for well logs, core and field data

Maurizio Giorgioni (1), Antonino Cilona (2), Emanuele Tondi (2), and Fabrizio Agosta (2)

(1) Shell Italia E&P S.p.A, Piazza dell' Indipendenza 11b, 00185, Roma, Italy, (2) Geology Division, School of Science and Technology, University of Camerino, 62032, Camerino, MC, Italy. E-mail: emanuele.tondi@unicam.it; fabrizio.agosta@unicam.it

In the last few years, numerous works addressed the deformation processes in carbonate rocks. These studies, generally sponsored by the oil industry, aimed to a better understanding of the structural and hydraulic properties of fault zones as well as of the subsurface fluid pathways in deformed carbonate rocks. This effort was mainly driven by the economic significance that carbonate rocks have for the oil industry, since they represent important natural reservoirs of hydrocarbons. According to the many field-based research scientific articles published in the recent past, both structural and hydraulic properties of fault zones, and their evolution trough time, exert a first order control on subsurface fluid flow and accumulation in fractured carbonate reservoirs. In order to convert this knowledge into predictive modeling tools that would help to optimize their exploitation, it should be useful to integrate the field-based data together with the subsurface data, which generally consist of core and well log (resistivity, acoustic, gamma ray etc.) analyses usually gathered to assess the formation evaluation of carbonate reservoir.

The presented work aims at filling this cognitive gap by the acquisition and elaboration of subsurface geophysical properties of a hydrocarbon-bearing oblique normal fault zone characterized by 10's of m offset, and cropping out in an exposed analogue of fractured carbonate reservoir (Maiella Mountain, Italy). The deformation mechanisms associated to the processes of fault nucleation and development within the Oligo-Miocene shallow-water carbonate rocks were documented in the recent past by our research group. In this present contribution, we present the results of our elaboration of the geophysical data, obtained from well logs oriented perpendicular to the study fault zone. These results are consistent with the following statements: a) there is a meaningful correlations between cores and digital images; b) a detailed structural analysis of the deformed carbonates can be performed by using well cores and digital image data; c) both matrix (primary) and fracture (secondary) porosities can be obtained from subsurface data; d) some possible relationships exist between secondary porosity and the measured log geophysical properties (P- and S-wave velocities, Resistivity). In conclusion, the results of this multi-disciplinary study, which involved the analyses of well logs, core and outcrop data of an hydrocarbon-bearing fault zone permitted us, therefore, to obtain useful correlation between fracture porosity and geophysical properties. We propose some practical solutions to compute the petrophysical parameters in order to assess both primary and secondary porosity in fractured carbonate reservoirs.