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A 2-D Petroleum System Modeling for Compressive and Extensional Terrains

This paper presents a computer program that allows geoscientists to model in 2-D deformation, source rock evolution and diagenesis in sandstone in structurally complex areas. The deformation module of the software is able to model different types of contractional structures such as duplexes, backthrusts, out of sequence structures and fault propagation folds. The code is also able to model extensional structures such as rollovers by considering inclined shear as the folding mechanism involved in the development of these folds. Users can apply any shear angle to model rollovers and the inversion of them by either using fault-bend folding or inclined shear. The source rock maturity module is able to model transformation ratio (TR), vitrinite reflectance, generation and expulsion of hydrocarbons based on the kinetic thermal evolution, laboratory data and primary reaction products. Recently, this software has been coupled with Touchstone[™] to generate 2-D diagenesis models of sandstones. The original version of this program was released by the French Petroleum Institute in 1995. Initially, the code was designed to model compressive structures using the fault bend folding mechanism with thrust faults dipping to a maximum of 30° and propagating in just one direction. The source rock evolution was limited to source rock maturity (TR) based on a kinetic thermal evolution. The new functions of the code are described and applied to some examples where they have been tested successfully. As examples, we present the results of modeling several cross-sections from Venezuela, California and Central Sumatra, Indonesia.