

Abstract

32nd gOcad Meeting
4-7 September 2012, Nancy, France

Restoring Past Deformations and Hydraulic fracturing using Python in GOCAD P. Mejia¹ and J.-J. Royer¹

¹ *Université de Lorraine UdL, CNRS-CRPG, ENSG-INPL, gOcad-ASGA, Vandœuvre, France, mejia.pablo@gmail.com, royer@gocad.org*

Abstract

Understanding the past history and deformations of basins is of paramount importance in a number of studies such as to identify favorable target mother rock formations, to reconstitute fluid migration in oil and gas surveys, to understand and predict fracturing, but also in mineral exploration studies for identifying mineralizing fluids pathways. This work has developed a tool for restoring a pile of multi-layered sediments accounting for the compaction using surfaces explicit representation. It is developed as a Python command within the Gopy research plug-in. The restoration technique is based on the multi-restoration surface method available in Kine3D2. Rock properties (such as porosity depth factor, porosity, depth, . . .) requested for performing the layer decompaction are assigned to each layer bottom surface. The variations of layer thickness due to the compaction are estimated using the Athy analytical formula enhanced for basin investigation.

In the last part, this methodology is applied to the Fore Sudetic Kupferschiefer located in the Southern Western part of Poland where the restoration allows the structural evolution of the system. Three main structural phases are observed: (i) the Late Permian-Cretaceous depositional phase during which sediments are buried; (ii) Late Cretaceous-Early Paleocene inversion phase at early Alpine together with an intensive erosion; (iii) a final Eocene-Quaternary depositional phase. The restoration of the whole sedimentary pile provided constraints to better understand the hydraulic fracturing stage which occurred during the inversion phase at the Late Cretaceous within the base Zechstein shales. This Late Cretaceous up-lifting provides the conditions for hydrothermal recirculation of mineralizing brines explaining the presence of Cu (Cu-Fe) sulfides, precious metals ores and gas pockets in the area. The restoring-decompacting procedure allows to reconstitute the burial, deformation and natural hydro-fracturing history of the basin.

The research leading to these results has received funding from the European Community's Seventh Framework Programme ([FP7/2007-2013] [FP7/2007-2011]) under grant agreement n° 228559. This publication reflects only the author's view, exempting the Community from any liability.

