Geophysical Research Abstracts
Vol. 21, EGU2019-1955, 2019
EGU General Assembly 2019

Numerical analysis of compaction effect: Implications for porosity and layer thickness variation of sedimentary rocks

Yeseul Kim, Changyeol Lee, and Eun Young Lee

Faculty of Earth and Environmental Sciences, Chonnam National University, Gwangju, Korea, Republic Of (eun.y.lee@chonnam.ac.kr)

In basin analysis and modelling study to understand the formation and evolution of a sedimentary basin, it is important to analyze the thickness and age range of sedimentary layers infilling a basin. Because the compaction effect reduces the thickness of sedimentary layers during burial, basin modelling studies typically restore the reduced thickness using the relation of porosity and depth (compaction trend). Based on the compilation plots of published compaction trends of representative sedimentary rocks (sandstone, shale and carbonate), this study estimates the compaction trend ranges with exponential curves and equations. Numerical analysis of sedimentary compaction is performed to evaluate the variation of porosity and layer thickness with depth. In sandstone, initial porosity lies in a narrow range and decreases consistently with increasing depth, which results in relatively constant thickness variations. For shale, the porosity variation shows two phases which are fast reduction until ~2,000 m in depth and slow reduction at deeper burial, which corresponds to the thickness variation pattern of shale layers. Carbonate compaction is characterized by widely distributed porosity values, which results in highly varying layer thickness with depth. This numerical compaction analysis presents quantitatively the characteristics of porosity and layer thickness variation of each lithology, which influence on layer thickness reconstruction, subsidence and thermal effect analyses to understand basin formation and evolution. It demonstrates that the appropriate application of compaction trend is an important factor in basin analysis and modelling.