Impact of Geologically Instantaneous/High-Speed Events on the Distribution of Fluids within Great Sedimentary Wedges

Lowrie, Allen[1], David T. King[2] (1) Consultant, Picayune, MS (2) Auburn University, Auburn, AL

In studies concerning the geologic evolution of great sedimentary wedges, previous work includes: sedimentary (facies) analysis; sequence stratigraphy; and sedimentary geochemistry; and integrative analyses of sedimentary and tectonic processes. An increasing component of exploration concerns the migration of fluids within the sediments. Rapid to sudden stress build-ups within the sediments drive these fluids along available migration routes. To date, there are few analyses that deal with such events, which we might call “instantaneous” or “high speed.”

For this discussion, let us define instantaneous/high speed as a geologic event whose overall duration lasts one thousandth of the temporal span of those on-going processes interrupted by the sudden event. These sudden events would range from the minute to the regional. For example, a specific sedimentary sequence, say, deposition of a high-stand systems tract (c. 10,000- 20,000 years duration), is affected by an earthquake. The actual seismic event may last seconds to a minute with the initial disturbances being terminated in a few months. Coarse-grained sediments in a turbidite may locally come to a final resting configuration in a day or less. Major seismic waves from a comet/asteroid impact along with aftershocks may last a year or two.

The disrupted material could presumably reach equilibrium in a decade or so. In this paper, we make comments about fluid migration possibilities and probabilities from the various instantaneous/high speed events are made and we discuss distances of potential lateral movements as well as amounts along various types of migration routes and periodicities of migrations. Further, there will be a compilation of such sudden processes and comments as to their respective influences upon Earth’s great sedimentary wedges and a discussion of defining evidence.