

Recent Advances in Computational Geosciences.

MELLO, ULISSES T., IBM T. J. Watson Research Center, Yorktown Heights, NY, 10598, USA.

Computational Geosciences are on the course of a technology revolution which is providing innovative means to conduct business more efficiently and economically. Integrated simulation of geological processes provides business decision-makers with the ability to analyze and develop solutions to very complex and difficult problems in the Earth Sciences. For example, the uncertainty and risk assessment of large-scale petroleum systems and reservoir production are being made tractable by the emerging capabilities in very large-scale computing, data mining and smart monitoring devices. Combining these capabilities with advances in algorithms, analytic methods, modeling and simulation, visualization, data management, and software technologies is enabling valuable scientific, engineering, and business opportunities. One of the key characteristics of the new developments in computational geosciences is the integrated, multi-disciplinary approach. In this presentation, I will discuss some examples in which the simulation of 3-D geological processes combined with data mining, optimization and visualization allows the extraction of both scientific and business knowledge. In petroleum exploration, for instance, these techniques are making it possible to create “living” basin models that couple the traditional data-set from “dead” databases with dynamic simulations. In these models the data is used to constrain multi-disciplinary, predictive, deterministic simulations whereas the modeling makes sense of large volume of data. In this context, 3-D “living” basin models evolve as more data is collected and as more scientific knowledge is coded in the simulations.