Summary of Projects Developed During 2005

Simulation of Axisymmetric Sonic Logging Instruments in a Borehole Environment Using hp-Finite Elements .
D. Pardo, T. Socha, L. Demkowicz, C. Torres-Verdin ,
Simulations of sonic instruments require the coupling of acoustics to model the borehole, with elasticity (or pore-elasticity) to model the rock formation. The flexibility of hp-Finite Elements allows for accurately reproduce both, the geometry (using small linear elements) and the wave structure of the solution (using large higher order elements).
2005. Status: 100% completed
Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

Simulation of Axisymmetric Resistivity Logging Instruments in a Borehole Environment Using a Self-Adaptive Goal-Oriented hp-Finite Element Method .
D. Pardo, C. Torres-Verdin, L. Demkowicz, L. Tabarovsky ,
We simulate a variety of 2D axisymmetric resistivity logging instruments widely used for the assessment and identification of electrical properties of the subsurface rock formation. Logging instruments include through casing resistivity tools (TCRT), induction instruments with detailed geometrical reconstruction of the mandrel, and normal/laterolog instruments. The use of a self-adaptive goal-oriented hp-FEM allows for high accuracy simulations of these logging instruments, which contain varying coefficients by up to 10 orders of magnitude, several singularities, and they may exhibit large dynamic ranges (up to 10^{15}).
2005. Status: 100% completed
Sponsors: Baker-Atlas, Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

Study, Design, and Implement a Goal-Oriented hp-Adaptive Algorithm for 2D Electromagnetic Problems .
D. Pardo, C. Torres-Verdin, L. Demkowicz, L. Tabarovsky ,
For a number of electromagnetic applications, an energy-norm based self-adaptive algorithm is not adequate. Frequently, the goal of our applications is not to minimize the energy-norm error. Rather, we are interested in minimizing the error in a "quantity of interest". Thus, a goal-oriented self-adaptive algorithm has been developed for both, electrostatic and electrodynamic problems.
2005. Status: 100% completed
Sponsors: Baker-Atlas.