Summary of Projects Developed During 2006

Simulation of Cross-Well and Borehole-to-Surface Measurements with One Cased Well.  
_D. Pardo, C. Torres-Verdin, I. Zhang_,  
Using casing as a large source, we study via extensive numerical simulations the sensitivity of cross-well and borehole-to-surface measurements to the presence of oil layers in the formation.  
**2006. Status: 100% completed**  
Sponsors: Shell International E&P.

Integration of a Parallel (Distributed Memory) hp-Finite Element Code with a Self-Adaptive Goal-Oriented hp-Algorithm for Elliptic Problems.  
_M. Paszynski, D. Pardo, C. Torres-Verdin, L. Demkowicz_,  
The combination of a parallel (distributed memory) hp-FEM with a self-adaptive goal-oriented hp-algorithm for elliptic problems allow for large, accurate, and fast numerical simulations of relevant engineering applications.  
**2006. Status: 100% completed**  
Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

_D. Pardo, C. Torres-Verdin, L. Demkowicz, Ch. Michler_,  
In order to simulate 2D and 3D through casing resistivity tools, it is necessary to consider a large computational domain in the vertical direction. The size of the computational domain is drastically reduced (from 25000 m to 5 m) by using a perfect matched layer (PML).  
**2006. Status: 100% completed**  
Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

_D. Pardo, C. Torres-Verdin, L. Demkowicz, L. Tabarovsky_,  
In order to simulate 3D through casing resistivity tools (TCRT) at 0 frequency (electrostatic), it is necessary to resolve a partial differential equation with varying coefficients by up to 10 orders of magnitude. In addition, these problems contain several singularities, and they typically exhibit a large dynamic range (up to 10^{13}).  
**2006. Status: 100% completed**  

_D. Pardo, C. Torres-Verdin, L. Demkowicz, L. Tabarovsky_,  
For a number of electrostatic 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 elliptic problems.  
**2006. Status: 100% completed**  