

## Summary of Projects Developed During 2007

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### **Development of a New Method Based on a Fourier Series Expansion in a Non-Orthogonal Coordinate System for Simulations of 3D Borehole Resistivity Measurements. Part II: AC Problems .**

*D. Pardo, C. Torres-Verdin, M. J. Nam, V. Calo ,*

The new method enables a significant complexity reduction from traditional 3D simulations when solving 3D resistivity logging instruments in deviated and/or eccentric wells.

**2007. Status: 100% completed**

Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

### **Simulation of 3D Resistivity Logging Instruments in a Borehole Environment Using a Self-Adaptive Goal-Oriented hp-Finite Element Method .**

*D. Pardo, C. Torres-Verdin, M. Paszynski ,*

To simulate a variety of 3D resistivity logging instruments widely used for the assessment and identification of electrical properties of the subsurface rock formation. Logging instruments include 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. 3D simulations are needed for studying borehole eccentricity, and for simulation of deviated wells.

**2007. Status: 100% completed**

Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

### **Simulation of 2D and 3D Laterolog Logging Instruments in a Borehole Environment Using an Embedded Post-Processing Technique, and Special Basis Functions for Electrode Modeling .**

*M. J. Nam, D. Pardo, C. Torres-Verdin ,*

We develop special techniques for simulation of laterolog measurements in a borehole environment. These instruments incorporate bucking and focusing electrodes, which are used to maximize simultaneously the depth of investigation and resolution of the measurements.

**2007. Status: 100% completed**

Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

### **Development of a New Method Based on a Fourier Series Expansion in a Non-Orthogonal Coordinate System for Simulations of 3D Borehole Resistivity Measurements. Part I: DC Problems**

*D. Pardo, V. Calo, C. Torres-Verdin, M. J. Nam ,*

The new method enables a significant complexity reduction from traditional 3D simulations when solving 3D resistivity logging instruments in deviated and/or eccentric wells.

**2007. Status: 100% completed**

Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).

### **Use of a Perfect Matched Layer for Simulation of 3D Through Casing Resistivity Logging Instruments with hp-Finite Elements .**

*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 may be drastically reduced (from 25000 m to 5 m) by using a perfect matched layer (PML).

**2007. Status: 100% completed**

Sponsors: Joint Industry Consortium on Formation Evaluation (C. Torres-Verdin).