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"NUMERICAL TECHNIQUES FOR THE SOLUTION OF THE COUPLING FLOW BETWEEN PETROLEUM RESERVOIRS AND WELLS"

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ABSTRACT

The estimation of oil production of petroleum reservoirs requires the solution of the coupled flow between the reservoir and the well. The oil, water and gas flow from the reservoir to the well can be controlled using different well completions in order to have an oil production with almost constant rate along the well. The multiphase flow in porous media governs the flow in the reservoir, while the Navier-Stokes equations and mass conservation for each phase govern the flow in the well.

Normally, when the simulation of the reservoir is done, the complex flow physics of the well is not properly treated. In the other hand, it also true that when the well is analyzed, the reservoirs are considered as an infinite media with constant pressure. However, what really matters in many situations is the flow physics at the interface between wells and the reservoir, therefore requiring the solution of the flow in the well and in the reservoir in a coupled fashion. A challenging aspect of this coupling is the large difference in spatial and time scales between the wellbore and the petroleum reservoirs. The flow in the wellbore can be considered as one dimensional, taking into account, through friction models, the additional pressure loss caused by the lateral mass income of oil, gas and water. To increase the production, smart devices can be installed in the production column in order to control the flow in the well. The use of these devices is a new approach in order to enhance the oil production, but they required a detailed analysis close to the well.

This mini-symposium welcomes articles dealing with all aspects of this problem, ranging from numerical schemes for unstructured meshes, multiphase flow simulation in the petroleum reservoirs and in the wells, fully implicit, semi-implict and segregated algorithms for the coupling treatment, as well as near well analysis of oil production problems.