Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **18 (2011)** 867-877

3D NUMERICAL SIMULATION OF THE DEEP BASIN GAS TRAPPING PROCESS IN UPPER PALEOZOIC FORMATIONS, ORDOS BASIN, CHINA

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Abstract. To thoroughly study the deep basin gas accumulation process in Upper Paleozoic formations, Ordos Basin, China, partial differential equations describing two-phase fluid flow in porous media elicited from Darcy law and material balance principle are introduced to simulate the gas-water displacement process. It is indicated from the numerical simulation that the deep basin gas in Upper Paleozoic formations, Ordos Basin, has two distinct gas accumulation periods with the first period from about 163Ma to 100Ma and the second period from about 100Ma to present. In the first period of gas trapping process, the increase and decrease of gas saturation in sand reservoir are controlled directly by the variation of gas supply rate of source rocks. In the second period of gas trapping process, the increase of gas saturation in sand reservoir is related to the notable uplift of the Upper Paleozoic formations, and the gas entered into the sand reservoir is discharged from the mud rocks in which the gas volume expands because of the pressure decrease induced by the formation uplift.

Keywords. deep basin gas; gas accumulation; numerical simulation; seepage; Ordos Basin.

AMS (MOS) subject classification:34H05, 34D99,93C15,93D99.

1 Preface

Deep basin gas was firstly discovered in some basins of North America. Gas is accumulated in tight sand rock in the downdip or the center of basin, with huge gas-bearing area, and water occurs in the upperdip of basin in sand rock with relatively good physical properties. The gas accumulation style was firstly described by Masters in detail in 1979[1]. Recent researches indicate that the Upper Paleozoic formations of Ordos Basin own the conditions favorable of the accumulation of deep basin gas, and the gas existent states take on the characters of typical deep basin gas fields.

Ordos Basin, covering an area of 370,000 km2, with sedimentary thickness from 5 to 18km, is one of the large sedimentary basins in China. The