Geophysical Research Abstracts, Vol. 8, 00433, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00433

Different regimes of fluid dynamic process in subduction zones

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A class of fluid dynamic models describing consolidation of sedimentary basins, free oscillation processes in waveguides, slow and quick (at the final stage) fluid dynamic processes of the evolution of a sedimentary basin in subduction zones is considered. The last model of quick fluid dynamic processes reflects the process of formation of hydrocarbon deposits in the zones of collision of lithospheric plates. The results of numerical simulation and diagrams reflecting consecutive stages of the gas–fluid dynamic front propagation are assessed by the example of the Caspian depression. Calculations with this model will simultaneously be carried out for the sedimentary basins of Timan–Pechora region, Barents Sea, Volga–Ural area, etc.

The suggested models can serve as an effective tool for integration of the geological and geophysical data. They may help the studies of a sedimentary basin as a historically evolving system to disclose its structure, origin, and stages of development. The models can form the basis for perfection and creation of new effective techniques of the accelerated search and exploration of oil and gas deposits.

In the zones of collision of continental lithospheric plates, the subducting plates drive down great amounts of sediments formed at the former passive margins. This sedimentary layer, enclosed between two plates, contains significant quantities of hydrocarbons and occurs under the effect of strong shear deformations and special thermodynamic conditions. As the mass of the sediments passing through this zone is rather great, there are favorable conditions for occurrence of numerous hydrocarbon fields of industrial importance, including fields–giants.