Geophysical Research Abstracts
Vol. 12, EGU2010-170, 2010
EGU General Assembly 2010

Development of the Barents Sea rift and its influence on sedimentation and hydrocarbon formation

Inna Balanyuk, Anatoly Dmitrievsky, Sergey Shapovalov, and Olga Chaikina
P.P. Shirshov Institute of Oceanology, Russian academy of Sciences, Moscow, Russian Federation (iebalanyuk@yandex.ru)

A special attention is given to the geodynamic active zone of the Barents Sea rift. Its development was accompanied by vigorous tectonic activity, propagation of deep faults, deep fractured zones that played an important role in fluid dynamic and thermobaric regime of the whole region. Geodynamic development of the Barents Sea rift not only played a substantial role in formation of as unique oil and gas fields as Shtokman, Prirazlomnoe and others, but created prerequisites for possible gas outbursts into near-surface sediments that could result, in some cases, in hydrocarbon formation.
All the Barents Sea deposits are situated in the epicenter of the rift and, most important, over the zone of listric faults intersection, which set up a knot system over the mantle diapir. It is confirmed by prospecting seismology. Intrusion of hot mantle matter with further cooling down of abnormal lense might be a possible cause of appearance and evolution of ultradeep depressions.
A high "seismic stratification" of the lower crust (nearly reaching the basement surface) at time scale about 8 sec. is typical for the deepest part of the depression. Supposing the "seismic stratified" lower crust correspond to "basalt" layer, this area is nearly upper crust ("granitic-gneiss") free. This fact confurmes conception on development of "granite free gaps" in the depression basement. Thick blocks of "seismically transparent" upper crust corresponding to the "granitic-gneiss" layer are marked out within Kolsk-Kanin monocline. An abrupt thickness decrease and appearance of "stratified" areas takes place at the southern edge of the depression.
A filling of the over-rift sag with sediments, revival of the faults and their effect on the filtration processes and gas hydrates formation took place in the South Barents Sea depression. Repeating activation of the fault blocks in the basement, especially during late Jurassic – early Cretaceous period contributed to formation of the structures related to the greatest deposits of this depression.
An extended field acoustic data collected in the Barents Sea led to understanding of general fundamental problems for all Arctic Seas and, first of all, the problem of Quaternary glaciations.
An analysis of Eurasian-Arctic continental margin shows correspondence between the rift systems of the shelf with those of the ocean. This relation can be observed by an example of the central Arctic region. All the rift systems underlying the sediment basin are expressed in the sea bed relief as spacious and extensive graben valleys burnished by lobes. The rift structures and the sediment cover are connected by the systems of transversal (or oblique) faults.
A study of the regional geologic structure of basins affords believing in the very complicated inner riftogenic structure of the base and the lower part of the sediment cover, which is represented by a combination of grabens and horsts bound by the same tectonic border in the form of high amplitude fault zones, and have a very high density of fault-fractured tectonics. In the same time, a branching of the rift structures related to rounding of large solid blocks of the crust, represented by Archaean or Baikal base prominences, takes place. Their frequent structural connection with the continental paleo-rift structures is ascertained, but the shelf rift system are not their straight prolongation and separated by base thresholds concealed under the sediment cover or by bulkheads expressed even in the modern relief.
The information on geodynamic development of the region, thermal convection and modern sedimentation enable assessment of the real potentiality for underwater works in the region, potential gas hydrates resources, and will help to assign a strategy of prospecting work, to range the known fields, to carry out a regional survey for engineering work.