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Geochemical haloes as an indication of over oil and gas fields in the Arctic shelf

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Hydrocarbon deposits at the Arctic shelf of Russia are a source of jet dispersion of heavy metals that forms haloes in sediments and in the bottom layer of sea water.

The intensity of the haloes and their spatial position are jointly determined by geological structure of their source and the environment, i.e. hydrocarbon deposits in host rocks, seafloor lithodynamics and oceanographic factors.

Based on theoretical works of Kholmyansky and Putikov (2000; 2006; 2008), an application of electrochemical modification of electric prospecting for offshore hydrocarbon exploration and detailed survey of the morphology of deposits was developed. Specialized equipment was developed for studies of electrochemical features of bottom water layer.

With this equipment one can detect ion anomalies in water and determine the type of deposit as gas, gas hydrate, gas condensate or oil. At operation, the unit with equipment is towed underwater off the stern of research vessel.

Type and configuration of deposits are determined based on occurrence of trace heavy metals detected by ion-selective electrodes.

The proposed method was applied to study a few hydrocarbon fields in Barents and Kara seas in 2001 - 2012 including Shtokman, Medyn, Polyarnoe, Prirazlomnoye and others. The results allowed us to trace the margins of the deposits in more detail, and geochemical data, in addition, showed the type of deposits. In general, the method has proven efficient and applicable to a wide range of hydrocarbon deposits.