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Basin modelling as a predictive tool for potential zones of chimney presence

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Today, the problem of global climate change is the most exciting challenge for the world community of scientists. One of the most recommended technology for decreasing carbon dioxide concentration in the atmosphere is its injection into natural geological reservoirs. The most significant attention is paid to this issue in Norway offshore. Such operations must be conducted with extreme caution since, in the petroleum systems of north European seas, such a phenomenon as a gas chimney is widespread. The most straightforward indicator for detecting them is pockmarking at the bottom of the sea. Nevertheless, it does not provide information about the depth of the gas formation zone. Thus, we cannot identify the genesis of the chimney, the instability of the gas hydrate zone or reservoir gas leakage. Identification of the chimney root also can be determined using seismic monitoring, but this is an expensive study.

In this work, we suggest the new method to identify the potential zones of reservoir chimney based on basin modelling data interpretation. We compare the anomalies of physical fields calculated in the simulator with detected acoustic noises on the seismic profile associated with the chimney being at a depth of ~ 2 km to the surface of the seabed. The pattern of the presence of the chimneys is determined. The study is conducted on a 2D basin model along with the PETROBAR-07 profile of the south-west part of the Barents Sea.