

## **A review of the seismic signatures of gas hydrate and associated free gas**

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**Key words** : Gas hydrate; BSR

**Abstract** : The typical seismic signature of oceanic gas hydrate is a high-amplitude, negative-polarity reflector that is largely parallel to the seafloor and crosscuts the stratigraphy. This bottom-simulating reflector (BSR) is caused by the high acoustic impedance contrast at the boundary between the solid gas hydrate in the gas-hydrate stability zone above and the free gas below. Other indicators of gas hydrate and sub-hydrate free gas include: elevated interval velocities and amplitude reduction or blanking above the BSR, enhanced reflection and frequency reduction below the BSR, and amplitude variation with offset along the BSR. However, these indicators, including the BSR, do not necessarily serve as evidence of thick accumulations of gas hydrate. The BSR can also be associated with recording artifacts, multiples, and the opal-A/opal-CT phase boundary. As such, there are BSRs without gas hydrate and vice versa. Gas or fluid escape features such as mud volcanoes, pock marks, seismic chimneys, and plumes in the water column can be supporting indicators of gas hydrate where the presence of gas hydrate is expected.

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