SEISMIC SIGNATURE OF GAS HYDRATE AND MUD VOLCANOES ON THE SOUTH AFRICAN CONTINENTAL MARGIN

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Widespread occurrence of bottom-simulating reflectors (BSRs) has been detected in multichannel seismic profiles on the upper continental slope in the southern periphery of the Orange River delta, probably indicating the presence of large quantities of gas hydrate in this area. This is the first time BSRs are recognized on seismic records on the southwest African continental margin south of the Walvis Ridge. Another remarkable feature in the area is the occurrence of a large number of mud volcanoes. The gas hydrate in this region may consist of a mixture of microbial and thermogenic gas, whereas much of the gas flowing through the mud volcanoes probably originated from deep-seated Aptian source shales. The distribution of the BSRs and the location of the mud volcanoes are controlled by the location of active faults.

The mud volcanoes form a distinct lineament subparallel to the bathymetric contours in this area. They are of different sizes and different stages of development. In several locations, the volcanoes penetrate the seafloor while in others they are buried. The exposed size of these volcanoes is typically few hundred meters in diameter with a height of 10–40 m. Faults play a key role in the formation of mud volcanoes on this part of the southwest African continental margin. Almost every mud volcano in this area is associated with a deep-seated fault. The faulting can be seen on both the shore-perpendicular and shore-parallel seismic sections.

The study area, which is located in the distal part of the Orange River delta, is characterized by overpressure that results in active fluid expulsion as shown by existence of the mud volcanoes, pockmarks, and possibly cold water corals thriving on methane gas seeps. The close proximity of the mud volcanoes to the zone where the BSRs crop out on the seafloor deserves attention. The seismic records strongly suggest that much of the gas in the mud volcanoes is originating from a deeper level than that of the gas hydrate. Faulting, again, could be the responsible factor for this unique situation.