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Gas hydrate occurrence in shallow water at the northeastern continental slope of Sakhalin Island, Sea of Okhotsk

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Release of methane in shallow water due to ocean warming/sea level falling, which may lead large mass wasting at continental margins, has been suggested as a possible cause to stimulate global climate change. In the northeastern continental slope of Sakhalin Island (Sea of Okhotsk), numerous gas hydrate-related manifestations including on and below the seafloor and in the water column as well as a large slope failure occurred. Recently, gas hydrate was found by core sampling at a depth as shallow as 385 mbsl, which is the shallowest gas hydrate occurrence record in the Okhotsk Sea. Current gas hydrate stability zone (GHSZ), modeled using previously observed methane-dominant gas composition, water temperature, and geothermal gradient, is consistent with the observed depth of bottom-simulating reflector on the slope. We explore the possibility of large slope failure by release of gas hydrate based on the past climate change history and inference from GHSZ modeling for the current state. Although prediction of the actual landslide is difficult, the timing is constrained as 50-20 ka based on sedimentation rate and thickness of a sediment layer over a clear sliding surface in the northern part. 120 m of eustatic sea level drop during the Last Glacial Maximum in this region, which caused the dissociation of gas hydrate to lead increase of slope instability, can be a possible geologic event. Furthermore, this region has undergone a rapid sea water temperature increase ($\sim$0.5°C in the last 50 years). If such a trend continues, additional slope failure can be expected in the near future.