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Response of a Surficial Gas Hydrate to Thermal Loading by a Weak Loop Current Eddy—Northern Gulf of Mexico Continental Slope

Repeated direct observations (manned submersible) of exposed gas hydrate sites on the upper continental slope (northern Gulf of Mexico) suggest that these exposures build and decompose between yearly observation periods. Although the consistency and rate at which gas is supplied to these sites is certainly a key to their maintenance as surface exposures, it has long been thought that thermal loading by warm Loop Current eddies plays a role in gas hydrate stability at the seafloor and in the shallow subsurface. During the period 8/00 – 11/01, instrumentation at an exposed gas hydrate site in Green Canyon Block 185 recorded the transit of a weak Loop Current eddy over the experimental site. The response of an exposed gas hydrate was recorded. A specially built doppler current meter was mounted on a collector cone that mechanically (Savonius rotor) measured gas emission from the hydrate. The z-component of the doppler tracked gas emission from the hydrate site. Pressure was also recorded by the doppler. A current meter mooring with two Aanderaa current meters recorded current speed and direction plus water temperature. A thermistor at the doppler and collector cone site measured water temperature at the seafloor. All instruments except the mechanical collector cone recorded data for about one year. An elevated temperature record (max excursion ~ 3.1 °C) occurred at the site for approximately two months. This temperature record is strongly coherent with pressure and the z-component of the doppler current meter record (a reflection of increased out-gassing). Satellite imagery confirmed that a weak Loop Current eddy moved across the site during the time of elevated temperatures, pressure, and out-gassing. The current (speed and direction), temperature, pressure, and out-gassing records exhibit variations at the tidal and 5-20 day frequencies. These data suggest a strong coherence between thermal loading by Loop Current events and out-gassing from surficial gas hydrates.