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Abstract

The Gulf of Mexico: A Natural Laboratory for studying Gas Hydrate Formation and Dissociation

The numbers of peer-reviewed papers published per year on the topic of gas hydrate in the marine environment have increased exponentially over the last decade; rising from about seven titles in 1990 to at least 109 titles in 2000. The general outcome of this work has been to roughly double magnitude estimates for the global reserves of fossil carbon, with the newly- discovered hydrate carbon occurring in deposits that can cycle in and out of the biosphere over much shorter time-scales than does oil or coal and which may offer very significant resources of producible natural gas. Recently we have seen good evidence for the "blast in the past" (Dickens, 1999) release of clathrate methane at ~55 MYBP and an intriguing proposal that the "clathrate gun" (Kennett and Cannariato, 2000) may be fired at inter-glacial intervals. It is tempting to describe this burgeoning interest as a paradigm shift in the understanding of the carbon cycle and its interaction with climate. One way to test some of the theories that must be proven to support the emerging gas hydrate paradigm is to work with the substance in a setting where it is accessible to direct manipulation and where cycles of formation and dissociation can be observed first hand. The Gulf of Mexico is one of a several continental margins where gas hydrate deposits occur in the upper-most portion of the sediment column. Many shallow deposits of gas hydrate are located there in water depths of 500 to 2000 m. The Gulf hydrates include oil and sediments and are an important substratum for microbial and metazoan life forms. Strikingly, when oil-rich gas hydrate decomposes, a portion of the oil reaches the surface, generating slicks that are visible from space. Variations in bottom water temperature impinge the limits of hydrate stability across much of the Gulf slope over periods of weeks. These circumstances suggest intriguing experiments that could be conducted in a natural laboratory for studying the dynamics of hydrate formation and persistence.

Citations

Dickens, G.R. 1999. the blast in the past. Nature. 401 (21 October). 752-755.
Kennett, J.P., and K.G. Cannariato, Hendy, Ingrid L., Behl, Richard J. Carbon isotopic evidence for methane hydrate instability during quaternary interstadials. 2000. in Science. pp. 128-133.