AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

Stephen Kirby[1], Michael Helgerud[2], William Waite[2], Laura Stern[2], Sue Circone[2], William Durham[3] (1) U.S. Geological Survey, Menlo Park, CA (2) U.S. Geological Survey (3) UC Lawrence Livermore National Laboratory, Livermore, CA

Challenges to Reliably Measuring the Fundamental Properties of Hydrocarbon Hydrates: A Status Report

Modeling in situ effects of gas hydrates on sediment properties using estimated hydrate properties has many practical applications. Until recently, reliable measurements of such properties were hampered by technical problems, such as the difficulty of making pure materials. These difficulties have been largely overcome using methods developed over the last 5 years, including a simple method for making >99% pure sI and sII hydrates. Preservation of such material by cooling to 77 K has made possible accurate measurements of thermal diffusivity and the ductile rheology of compacted sI methane hydrate possible. By integrating hydraulic compaction and sensors into the synthesis vessel, reliable measurements of wavespeeds (Vp and Vs) and thermal conductivity (k) have been made on compacted sI and sII hydrates. Standout results include discovering hydrocarbon hydrate properties are generally very different from those of ice. For example, sI methane hydrate is 20 to 50 times stronger than ice and has a thermal conductivity less than 20% that of ice.

While progress has been made in measuring physical properties of pure hydrates, these data have not been tested for internal consistency or sensitivity to hydrate composition. Although these data are now being used with rock-physics theories to evaluate the effects of hydrates on sediment properties, these theories are largely untested. Finally, the problem of retrieving naturally occurring hydrates without partial decomposition has not been solved, and this shortcoming has prevented comparison of naturally occurring hydrates with synthetic hydrates.