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### **Ultrasonic Velocities as a Function of Confining Stress and Dispersion in Carbonates**

This laboratory study was carried out to investigate the influence of confining stress and dispersion on acoustic velocities in carbonates. Ultrasonic compressional- and shear-wave velocities have been measured on 265 carbonate samples from Cretaceous and Miocene hydrocarbon reservoirs in the Middle East, Far East, and from ODP Leg 194 using a pulse transmission technique. The carbonate samples all have porosity values larger than 5% and cover a wide range of pore types and permeabilities. The samples were measured under increasing effective stresses in a series of small steps from 2 MPa up to 80 MPa at a frequency of 1MHz. Several samples have been randomly chosen to be measured with a frequency of 0.5MHz, at elevated confining stress of up to 20 MPa, to examine velocity dispersion. Additionally, most samples were analyzed quantitatively for the pore geometry and pore type in thin sections.

Experimental results show that crack closure occurs at pressures ranging from 20 MPa to 40 MPa with most of the samples and no significant correlation with porosity exists. The pore geometry may be more relevant than total porosity in describing the stress sensitivity of these carbonates. Dispersion in carbonates appears to follow different mechanisms than those acting in sandstones. Preliminary results of the dispersion experiment show that not all samples follow the velocity predicted from Biot-Gassmann theory.