# *Impact of chemical diagenesis on sediment acoustic properties*

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## ABSTRACT

Chemical diagenesis is the alteration of sedimentary components at various rates to thermodynamically stable products in response to existing conditions of temperature, pressure and pore fluid composition. In some cases, this alteration leads to cementation, which has the potential to result in abnormally high shear velocities and atypical degrees of compaction for a given overburden pressure. Alternatively, chemical diagenesis may result in the localised transformation of individual particles, with little or no effect on sediment acoustic properties. Sediments from two diverse sites near the Juan de Fuca Ridge, a currently active hydrothermal spreading centre, were studied to determine the impact of chemical diagenesis on acoustic properties. Data include compressional and shear velocities at *in situ* overburden pressures and several indicators of chemical diagenesis including microfabric characteristics, mineralogical assemblages, and compositions of pore fluids and solids. At Ocean Drilling Program, Site 857, the geothermal gradient and pore fluid composition were normal, indicating little or no convective flow of heat or fluid. Chemical diagenesis at Site 857 was limited to sediments adjacent to basaltic sills. Site 858 was located in an area of high heat flow and circulating, basement-altered fluid. The sediments at these sites could be classified into various depth-related regions where distinctive suites of alteration minerals dominated. The Juan de Fuca spreading centre represents a complex environment where nongeothermal temperature gradients and circulation of pore fluids of non-steady-state composition produce localised alteration and sediment property heterogeneity.