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The relationship between diagenesis and physical properties of sediments in the Shikoku Basin; Preliminary Results

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Integrated Ocean Drilling Program (IODP) Site C0011 is located on the northwest flank of the Kashinosaki Knoll which is the crest of bathymetric high in the Shikoku Basin. In this site, the physical properties of sediment were measured to provide high-resolution data on the bulk physical properties and their downhole variations. All physical property (moisture and density, gamma ray attenuation density, magnetic susceptibility, P-wave velocity, thermal conductivity, vane shear, and electrical resistivity) measurements were made after cores had been imaged by X-ray CT and had equilibrated to room temperature (about 20 °C). From the surface to 50 mbsf, bulk density generally increases and porosity decreases along the downhole. The trend reverses between 50 and 80 mbsf and then remains relatively constant until 240 mbsf. A sharp increase in bulk density (decrease in porosity) occurs between 240 and 270 mbsf, after which a steady consolidation trend continues to the base of the borehole. The dramatic change of physical properties in this section was estimated to be caused by sediment diagenesis which is cementation by the opal-A and opal-CT transformation, because the sediment texture observing from core description and CT scan is unconverted in this section. In the result of sediment texture analysis for total 128 subsamples of Holes C0011C and C0011D, the sediment texture does not show the features related to the change of the physical property between 240 and 270 mbsf, except relatively high mean grain size and sand contents at 235 mbsf. In the quantitative analysis of opal contents for 11 subsamples of Holes C0011C and C0011D, using X-ray diffraction (XRD) and computer software based on Rietveld quantification method, the contents of clay mineral and opal-A are high and also unconverted in all samples, whereas the contents of opal-CT are few. The result of quantitative analysis of opal contents using XRD does not support the sediment diagenesis caused by the opal-A and opal-CT transformation. Therefore, the sediment diagenesis in Site C0011 may not be controlled by the opal-A/opal-CT and opal-CT/quartz transformation and additional study is required to determine the relationship between diagenesis and physical properties of sediments in the Shikoku Basin.