# Silica diagenetic process in the Japan Sea and Japan Trench: A comparative study from core-log-seismic data integration

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Core, log and seismic data sets from ODP sites in the Japan Sea, and DSDP and ODP sites in the Japan Trench off Sanriku were used in this study which focuses on the integration of downhole logs and seismic data to trace back the process of the silica diagenesis in high-resolution scale. Based on these integrated work of high resolution data sets, silica diagenetic process in the Japan Sea and Japan Trench were traced back to the 16 Ma and discussed thoroughly the process from paleoenvironmental and paleoclimatic point of view.

Silica diagenesis is the process of several dissolution- reprecipitation phase transitions of biogenic silica during burial of marine sediments. In the process, Opal-A is dissolved and partly reprecipitated as Opal-CT, and then transformed to quartz with temperature, time, host rock lithology and pore water chemistry changes.

We used core, log and seismic data sets from ODP Sites 794 and 794 located at the western and northern margin of the Yamato Basin, Japan Sea, and DSDP Sites 438, 439 and ODP Sites 1150, 1151 located at the inner slope of the Japan Trench off Sanriku. Data sets from the DSDP sites are not comparable to the ODP sites especially in the core-log-seismic integration. Apart from the similar data sets at ODP sites from both areas, we focused mainly on the silica diagenetic process in the Japan Sea due to the appearance of complete silica diagenetic boundaries, and their diagenetic zones.

This study focuses on the integration of downhole logs and seismic data to trace back the process of the silica diagenesis in high-resolution scale. Detailed interpretation and characterization of the defined seismic stratigraphic units and silica diagenetic stages were done on different data sets and processed results including synthetic seismograms, well-log cross-plots. Interpretation of downhole logs and physical properties' data supported detailed seismic unit boundaries. Well-log cross-plots were used to understand the relationship between the physical property changes and diagenetic processes, and Formation Microscanner (FMS) profiles were analysed together with resistivity and caliper logs for diagenetic changes in detail.

In the Japan Sea, seismic profiles near ODP site or further to the regional extent, clearly show silica diagenetic boundaries, especially opal-A/CT transition, and their diagenetic zones, transparent thick opal-A zone, stratified and strongly reflecting opal-CT zone, and stratified and medium reflecting quartz zone. However, seismic profiles near DSDP sites in the Japan Trench show unclear silica diagenetic boundaries with transparent and very thick opal-A zone where strong reflectors mixed in several depths, stratified strong reflectors in opal-CT zone, and weak reflecting quartz zone. Seismic stratigraphic correlation between the sites identified similarities and differences lithologically, seismically and diagenetically. Seismic stratigraphic results and well-log cross-plots clearly show silica diagenetic process and their diagenetic history in detail.

Silica diagenetic boundaries, especially Opal-A/CT boundary, are clear on downhole logs and seismic, and their appearance on the downhole logs are similar between Japan Sea and Japan Trench ODP sites. However their diagenetic changes within each stages, opal-A, opal-CT and quartz, are different even thought resistivity corresponds with diagenetic changes at all sites. Moreover, Formation Microscanner (FMS) images are better to trace diagenetic changes than diagenetic boundaries. FMS images clearly show the interbedding of thin chert and porcellanite layers in the opal-CT zone at Japan Sea ODP sites, and dolomite layers at Japan Trench ODP sites. Well-log cross-plots at Japan Sea data show the relationship among the seismic, lithologic and diagenetic characters, and unit boundaries too. Opal-A and opal-CT boundary is clearly seen as a large gap on most of the cross-plots, however Opal-CT/ quartz boundary is not clear.

Based on these integrated work of high resolution data sets, we traced back the silica diagenetic process in the Japan Sea and Japan Trench to the 16 Ma and discussed thoroughly the process from paleoenvironmental and paleoclimatic point of view.