

THE EFFECT OF STYLOLITE SPACING ON QUARTZ CEMENTATION IN THE LOWER JURASSIC STØ FORMATION, SOUTHERN BARENTS SEA

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ABSTRACT: The shallow marine Lower Jurassic quartz arenites of the Stø Formation in the southern Barents Sea comprise (1) intervals where dispersed detrital clay is absent, and where the spacing between clay-rich laminae that evolved into stylolites upon burial is exceptionally large, up to several meters, and (2) intervals where minor detrital clay matrix occurs, clay laminae are very common, and stylolite spacing is typically less than a centimeter. Point counting of thin sections and cathodoluminescence micrographs shows that quartz cement contents are far lower in the intervals where stylolite spacing is exceptionally large, 4--11%, versus 10--20% outside these intervals. There is also a correlation between distance to nearest stylolite and volume of quartz cement. Samples located a centimeter or less from a stylolite contain 10--20% quartz overgrowths, for distances of 3--20 cm quartz cement content is 4--10%, and only 3--8% when the closest stylolite is more than 20 cm distant. Modeling of quartz cementation with the Exemplar™ diagenetic modeling program indicates that the observed trend of decreasing quartz cement abundance outwards from stylolites is not caused by variations in grain size, degree of grain coating, or content of quartz grains, i.e., the trend is not due to more quartz surface area being available for overgrowth formation close to stylolites. On the contrary, the modeling suggests that the samples situated more than 20 cm from stylolites contain 5--8% less quartz cement than what would have been the case given a more normal stylolite abundance. This study indicates that sandstones with exceptionally few clay-rich or micaceous laminae and without clay or mica at individual grain contacts will be significantly less quartz cemented and more porous than other sandstones with similar temperature histories. However, such sandstones seem to be highly unusual on the Norwegian continental shelf. This suggests that exceptionally low abundance of stylolite precursors may be of only local importance for preserving reservoir quality at elevated temperatures, and that it is normally not necessary to include stylolite spacing and distance to the nearest stylolite as variables in quantitative models of quartz cementation.