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δ^{30}Si of off-axis ridge fluids: constraints on the oceanic Si budget

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We measured the dissolved δ^{30}Si of near-basement pore water samples collected at ten boreholes drilled along a E-W transect on the eastern flank of the Juan de Fuca ridge (JdFR) during ODP Leg 168. The fluids closest to the ridge axis display low temperature (15-23°C) and high Si contents (508<[Si]<638 µmol kg^{-1}) relative to the local bottom seawater (173<[Si]<190 µmol kg^{-1}). Their Si isotopic signature is also distinct (1.71‰<δ^{30}Si<1.72‰) from the North Pacific Deep Water (0.51‰<δ^{30}Si <1.18‰). Further to the East, the decrease in [Si] (from 638 down to 208 µmol kg^{-1}) is correlated with a slight increase in the δ^{30}Si (1.71 to 2.07‰) reflecting the Si uptake by smectitic clays at intermediate temperature (38-40°C). Warmer fluids (40-60°C) display similar [Si] (155<[Si]<173 µmol kg^{-1}) but have lighter δ^{30}Si (1.55‰<δ^{30}Si<1.57‰) due to silicate replacement by carbonates. With a water flux of 1.8-2.6 10^{15}kg yr^{-1} the low-T off-ridge fluids (<25°C) may have a significant impact (0.9-1.6 Tmol yr^{-1}) on the deep ocean Si budget. Because of their heavy signature, their advection into the deep ocean may concur with the preformed (unused Si exported from surface) and regenerated (dissolution of sinking silica particles) Si to account for the deep ocean δ^{30}Si.