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Microscale, *in situ* δ^{30}Si analyses of authigenic aluminosilicates - new constraints on the use of pore fluid Si isotopes as a tracer for marine silicate alteration

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Marine silicate alteration, including reactions of dissolution (silicate weathering) and precipitation (reverse weathering), is considered to have a major influence on marine carbon and cation cycles in the modern-day ocean as well as in the geological past. In recent years, the identification of marine silicate alteration processes by shifts in the pore fluid silicon isotope abundances (δ^{30}Si) has become increasingly important. However, the scarce constraints on the δ^{30}Si signature of the precipitation products (i.e. authigenic aluminosilicates) remains a major limitation of this method. Current estimates rely entirely on sequential leaching of bulk sediments, likely obscured by unintentional dissolution of non-target mineral phases in different leachates. In this study, we report on the first *in situ* δ^{30}Si measurements of marine authigenic aluminosilicates. We identify the clay mineral glauconite as the dominant authigenic phase in recent sediments from the Oregon margin, eastern North Pacific. Glauconites occur as pellets reaching up to several 100 µm in diameter, comprising distinct maturation states. We measure *in situ* δ^{30}Si values ranging from -3.17 ‰ to -2.24 ‰, falling on the lower end of clay δ^{30}Si values reported from terrestrial environments. A trend to lower δ^{30}Si values, accompanied by decreasing Al/Si ratios, is interpreted as an isotopic shift caused by advancing glauconite maturation. The glauconite geochemical trends differ from trends recently identified in immature Peruvian authigenic smectites. In these Peruvian samples, Si isotopes decrease, but at overall higher values, while the Al/Si ratios increase with maturation. These contrasting geochemical shifts highlight that authigenic aluminosilicate composition can evolve differently dependent on time, cation availability and the evolution of the microenvironment during early diagenesis. This finding has important implications for future interpretations of marine silicate alteration reactions based on pore fluid δ^{30}Si signatures.