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Pushing the limits of Sr isotope stratigraphy in the Pliocene, Jurassic and Cretaceous

Strontium isotope stratigraphy can be used to date and correlate rocks, but with what precision and accuracy? Values of $^{87}Sr/^{86}Sr$ can be obtained to a precision of ± 0.000 003, which equates to ± 50 ka in the early Miocene, but other uncertainties compromise data of this quality. For example, interlaboratory bias add uncertainties that are larger: data from an interlaboratory comparison will illustrate this point. Furthermore, calibration curves have uncertainties that are ± 0.000 004 or more (usually two to three times more). With a measurement precision of ± 0.000 003, we need also to re-assess the assumption that sea water is everywhere isotopically homogenous with respect to its Sr isotope ratio, as a simple mixing model will show. Despite these problems, under the most favorable circumstances, Sr isotope stratigraphy outperforms ammonite biostratigraphy (in the Jurassic) and diatom biostratigraphy (in the Pliocene), as examples will show.

Strontium isotope stratigraphy can also be used to estimate the relative duration of biozones. As modern timescales (*e.g.* Gradstein *et al.* 1994) rely, in part, on assigning (some) numerical ages on the basis that biozones are of equal duration (because there is sometimes no other way to divide time), the ability to measure the relative durations of biozones should assist the construction of such timescales. The value of this technique will be explored using new data from the Toarcian, Hauterivian, and Valanginian, intervals of time.