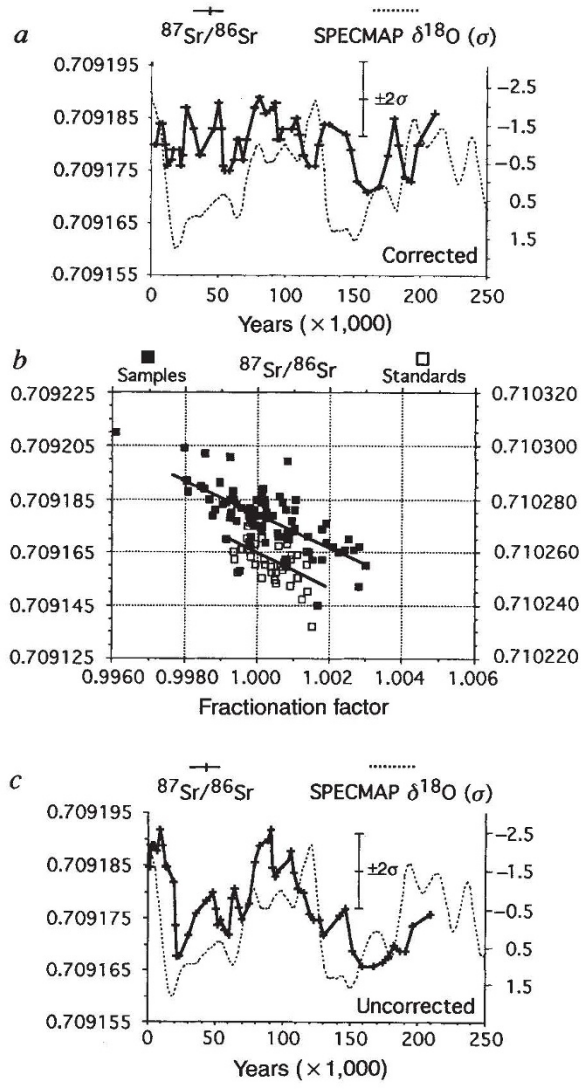
Artefacts in Sr isotope records

SIR — High-resolution time-series analysis of single-species planktonic foraminifera from Indian Ocean Drilling Project (ODP) Site 758 resulted in the apparent resolution of 100,000-year cyclicity in seawater $^{87}Sr/^{86}Sr$ which covaried with glacial–interglacial ice-volume fluctuations ($\delta^{18}O$) over the past 450,000 years[1]. Although the variability in $^{87}Sr/^{86}Sr$ was at, or near, analytical resolution at the $\pm 1\sigma$ level, the persistence of the signal over several 100,000-year cycles, a strong in-phase covariation with global ice volume, and structure similar to that reported from Pacific core V28-238 (ref. 2), lent support to possible interpretation as an environmental signal associated with glacial–interglacial climate change[1,3].

To test the reproducibility and potential character of this apparent signal, we generated a high-resolution record for the North Atlantic using the benthic foraminifera *Cibicides wuellerstorfi* from core *Chain* 82–24 (ref. 4). This Sr isotope record does not show resolvable evidence of glacial–interglacial cyclicity (*a* in the figure). However, in the course of these analyses, which were performed in dynamic multicollection mode and reduced using a linear-law mass fractionation correction, we noted and corrected for a systematic and positive relationship between mass fractionation and fractionation-corrected $^{87}Sr/^{86}Sr$ values (*b* in the figure). This fractionation bias results from a failure of the linear law to correct completely for fractionation effects. Without this additional correction, the *Chain* 82–24 record did show a 100,000-year Sr-isotope signal and an in-phase relationship with ice-volume (*c* in the figure). Thus, an apparent (uncorrected) record of 100,000-year variability in the Sr isotope composition of sea water for this site is an analytical artefact that is apparently linked to environmental parameters that vary on glacial–interglacial timescales. Resolution of this linkage awaits further work, but does not detract from the conclusion that a glacial–interglacial Sr isotopic signal is not present in *Chain* 82–24. Similarly, high-precision attempts at replicating the V28-238 signal have also been unsuccessful[5,6].



Seawater $^{87}Sr/^{86}Sr$ data from North Atlantic sediment core *Chain* 82–24. *a*, These high-precision data show no evidence of glacial–interglacial variability as depicted by the SPECMAP $\delta^{18}O$ curve[8]. *b*, Fractionation factor for samples and standards documenting positive relationship between high Sr-isotope values and increased fractionation (low values). *c*, Same data as in *a* before correction for fractionation bias shown in *b*. The uncorrected data show 100,000-year glacial–interglacial variability. Data are plotted relative to an SRM-987 value of 0.710257. Error bars are for Sr-isotope data.

The observations of an analytical artefact affecting the *Chain* data caused us to carefully recheck our ODP Site 758 results for similar effects. These data were collected in static mode with an exponential fractionation correction[7], and a fractionation bias could not be detected in the standards or samples of this dataset. Therefore we have no reason to suspect that the glacial–interglacial signal observed in Site 758 is an analytical artefact related to fractionation bias. Nonetheless, the high-precision results presented above on the *Chain* data argue strongly against the existence of global changes in seawater $^{87}Sr/^{86}Sr$ (at the level of measurement precision) on glacial–interglacial timescales.

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Krill biomass in the Atlantic

SIR — Acoustic target strength (TS)[1] is an important parameter when using acoustic survey data to estimate the abundance of Antarctic krill (*Euphausia superba* Dana). Recently, when the TS of krill was reassessed[2,3], it emerged that the previous values had been too high, leading to unrealistically low biomass estimates. Following the re-evaluation, it was recommended that new values[3] should be used for the analysis of all acoustic survey data, including the re-analysis of important existing datasets[3]. Here, using recent krill TS values[3], we report an estimate for the biomass of krill in the southwest Atlantic, one of the main spawning and feeding grounds of Antarctic krill.

As part of the international programme, the Biological Investigation of Marine Antarctic Systems and Stocks (BIOMASS), a large acoustic survey (first international BIOMASS Experiment — FIBEX) was undertaken in selected regions of the Southern Ocean. The survey covered areas thought to include a high krill biomass, and the survey strategy assumed that areas not sampled were characterized by a low krill biomass[4]. Recent evidence from fisheries data suggests that most of the krill biomass in the southwest Atlantic region is within the geographical limits set for the FIBEX survey, with the highest concentrations of