

ISOTOPE STRATIGRAPHY: PHANEROZOIC EXPERIENCE AND PROTEROZOIC POTENTIAL

VEIZER, J. Institut für Geologie, Ruhr-Universität, Bochum, Germany and Ottawa-Carleton Geoscience Center; University of Ottawa, Ottawa, Canada

A new generation of $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ curves for Phanerozoic seawater, based on ~4500 stratigraphically well defined and well preserved samples, results in much better constrained secular trends. A comparable curve for $\delta^{34}\text{S}$, based on structurally bound sulfate in carbonates, is under development in Bochum and Münster. At this stage, Sr isotopes provide the best stratigraphic and correlation tool, particularly for intervals of rapid $^{87}\text{Sr}/^{86}\text{Sr}$ change, such as the Silurian; the attained resolution for well preserved pure calcitic samples (e.g. brachiopods) is 1-2 biozones, that is ~1.5 to 2 Ma. The drawback is the relatively easy resetting of $^{87}\text{Sr}/^{86}\text{Sr}$ values. The carbon isotope signal, on the other hand, is considerably more resistant to resetting, but its drawback is the non-unique value within the oceans. As a consequence, one can utilize the trends, but not necessarily the absolute values, for correlation purposes.

The uncertainty in absolute ages, of up to 108 years, more than any dearth of suitable samples, is the major impediment for development of comparable isotopic curves for the Precambrian. An exception to this state of affairs is the Neoproterozoic, with a steep slope for $^{87}\text{Sr}/^{86}\text{Sr}$ and $\delta^{34}\text{S}$, the predominance of exceptionally heavy $\delta^{13}\text{C}$ values with interposed negative spikes, and abundance of micritic limestones. These tracers, if employed in complementary fashion, may potentially provide the tool for dating and correlation of Neoproterozoic sequences.