Dinosterols or dinocysts to estimate dinoflagellate contributions to marine sedimentary organic matter?

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ABSTRACT: Dinosterol (4α,23,24-trimethyl-5α-cholest-22E-en-3β-ol) is frequently used as an alternative to dinoflagellate cyst (dinocyst) counting in paleoceanography to assess dinoflagellate inputs to marine sediments. However, recent studies have shown poor correlation between these two proxies in continental-margin sediments. We reevaluated the relationship and expanded it to include a suite of biogeochemical transformation products of the parent dinosterol (dinosterone, dinostanone, and dinostanol). These dinoflagellate-specific 4α,23,24-trimethyl steroidal species ($\Sigma_{4\alpha\text{-stanol}}$) are compared to dinocyst counts in sediments from the western Mexican margin (375-3,500 m). Samples were taken from subsurface (3-6 cm) and down core (16-27 cm) to reflect widely contrasting organic carbon content and redox conditions. A strong correlation was found between the sum of all dinoflagellate-derived sterols, $\Sigma_{4\alpha\text{-stanol+ol}}$, and total dinocyst counts, highlighting the importance of including diagenetic alteration products of the parent molecule when exploiting organic biomarkers in paleoceanographic studies. In low-energy environments and for well-preserved samples, such as those studied in this work, both methods provide robust, internally consistent data, suggesting that when diagenetic transformation products of dinosterol are taken into account, gas chromatography and optical microscopy could be used interchangeably to estimate dinoflagellate inputs to marine sediments.

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