Reconstructing Cenozoic sea surface temperatures from biogenic opal-A $\delta^{18}O$.

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Benthic foraminifera $\delta^{18}O$ increases by 5.4 ‰ through the Cenozoic Era, the past 65 million years of earth history. This increase is attributed to growth of global ice sheets and global ocean cooling. On the other hand, $\delta^{18}O$ of planktonic foraminifera do not exhibit any significant change introducing the concept of the "cool tropics paradox." Subsequently, the lack of change in $\delta^{18}O$ of planktonic foraminifera was explained by secondary postburial alteration of the primary planktonic isotope signal. We provide an alternative record of sea surface water characteristics of Cenozoic age by measuring $\delta^{18}O$ of siliceous microfossils. The scarce phase of marine silica, unaltered biogenic opal-A, composed of diatoms, radiolaria and sponge spicules, was separated and purified from Cenozoic sediments. We measured $\delta^{18}O$ of siliceous microfossils from a set of the drilled cores: DSDP 278 from the South Pacific, DSDP 513 from the South Atlantic, and ODP 1050-1053 and DSDP 391 from the North Atlantic. The purity of the biogenic opal and its mineralogical phase was assessed with SEM, SEM/EDS, XPS, and XRD. The $\delta^{18}O$ of biogenic opal-A fluctuates around 43.0 ‰ through the Cenozoic Era, comparable to the Southern Ocean average of 43.2 ‰ of diatoms and radiolaria from the last 30,000 years representing the last glacial and interglacial period. Taking into consideration changes in $\delta^{18}O$ associated with bottomwater interaction with the lower crust and changes in sea level associated with waxing and waning of ice sheets, we conclude that the surface water temperature remained the same. This revives the original idea of the "cool tropics" paradox with a carbonate independent $\delta^{18}O$ record.