

EGU21-15868

<https://doi.org/10.5194/egusphere-egu21-15868>

EGU General Assembly 2021

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The Role of Diagenesis in the Apparent Rise of Diatoms

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Diatoms are one of the most dominant primary producers in the ocean today and largely control the modern marine silica cycle. Their ecological expansion in the Cenozoic is thought to have lowered silica concentrations by two orders of magnitude and has been linked to the rise of grasslands and baleen whales. According to the fossil record much of diatoms' rise to dominance occurred in the past 20 m.y.; however, silicon isotope evidence suggests an earlier expansion. Using a diagenetic model and collated deep sea drill core data, we examine how changes in bottom-water temperature and sedimentation rates over the past 65 m.y. affected the burial efficiency of biogenic silica. We find that once taphonomic potential is taken into account there is no support for the traditionally recognized ~5-20 Ma increase in diatom abundance. These results help reconcile interpretations based on geochemical and fossil data, and add to mounting evidence pushing back the evolution of the modern silica cycle to before 20 Ma and possibly earlier than 40 Ma.