Influence of Biogenic Silica from Terrestrial Vegetation on Riverine Systems and Diatom Evolution

B. OPALINSKA AND S. A. COWLING [1]

[1]Department of Earth Sciences, University of Toronto, 22 Russell Street, Toronto, Ontario M5S 3B1, Canada

Presently within the scientific literature no terrestrial biogenic silica models exist that compare by magnitude, processes transporting silica. Although studies are available for specific plant functional types, such as grasslands, the measured fluxes cannot be applied to predict biogenic silica cycling within different grassland ecosystems. Change in vegetation type has the potential to alter dissolved concentrations of Si in rivers and ultimately the oceans. Diatoms greatly depend on Si concentrations for growth, and as a result land cover change may have influenced onset diatom radiation during the Cenozoic. To expand our understanding of this cycle, a terrestrial biogenic silica model is proposed. This model accounts for biogenic silica production, dissolution and leaching through soils, as well as providing estimates for annual silica soil storage. Among land cover classes, conifer dominated regions expressed the highest silica fluxes in rivers, 4.70 kg ha^{-1} yr^{-1}, while wetlands showed the lowest, 0.258 kg ha^{-1} yr^{-1}. This variation can be explained by both biological process such as production and dissolution, and abiotic processes of leaching. A case study performed using the constructed biogenic silica model, showed an increase in oceanic DSi concentration during the Miocene (period of diatom diversification). However, this increase does not appear to have been sufficient to trigger global diatom radiation, suggesting multiple geographically isolated locations for this diversification.