

Dynamic silicon cycling at the land-ocean interface

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The supply and distribution of dissolved silicon (Si) in the oceans is a key factor in the growth of marine diatoms and Rhizaria, which precipitate biogenic silica (or opal, hydrated SiO₂) and are responsible for a significant proportion of global export production. Rivers and groundwater have long been considered the major inputs of dissolved Si, which is released during the weathering of siliceous rocks. In the polar regions, glaciers are known sources of both dissolved and particulate phases of Si, but the impact on oceanic systems needs further quantification to produce a more robust global budget. Silica phases reaching the land-ocean transition zone are subject to dynamic cycling processes in fjords, estuaries, coastal waters, and continental shelf sediments. Here, we will present some of the recent progress made in understanding silicon cycling at the interfaces between terrestrial environments, coastal seas, and shallow marine sediments. In particular, we will explore how stable silicon isotope measurements can be used to disentangle the different reactive silica pools in these complex environments, and the processes that supply this key nutrient to wider marine ecosystems.