# The Influence of Silicate on Exchange Rates between Sediment and Water in the Shallow-Water Coastal Ecosystem

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Often, diatoms dominate among the sedimented phytoplankton cells during periods of new production and in coastal areas (Wassmann *et al.*, 1996). Moreover, diatoms frequently form important components of benthos of shallow marine environments and may contribute considerably to the overall primary productivity in such systems (Fielding *et al*., 1988). In order to realize this high growth potential, however, dissolved silicate (DSi) is required. While, silicate (Si) regeneration is fundamental for the maintenance of primary productivity in the coastal marine environments. As a consequence, DSi is released into the environment and can be utilized by phytoplankton or exported to nearby marine areas. Due to the high surface-volume ratio of coastal ecosystems and the importance of bacterial colonization of sea bottom, the mineralization processes take place mainly in the sediment. Therefore, benthic flux of Si may be play important role in the supply of DSi for growth of diatoms. On the Si regeneration was determined 7 times in the shallow-water coastal ecosystem (Shido Bay, the Seto Inland Sea) during 1999 to 2000. The study was carried out using core incubation ($J_{INC}$) and in addition by determining gradients of DSi in pore water ($J_D$). Incubating flux ($J_{INC}$) did not exhibit a clear pattern with season; and flux ranged from 1386 to 4456 μmol $m^{-2}$ $d^{-1}$, which was 69% higher than calculated flux ($J_D$; 380 to 998 μmol $m^{-2}$ $d^{-1}$). Water temperature explained 24% of season to season variability in incubating flux, dissolution rates increase linearly with temperature ($r=0.49$, $p<0.1$). Salinity described 23% of the variability in measured rate of a Si flux. This result reflects the negative ($r=-0.47$, $p<0.1$) influence of salinity on its flux. Moreover, the inverse relationship between the Si flux and biogenic silica content (Bio-Si, $r=-0.64$, $p<0.05$) suggest that about 41% of the variability in the Si flux were explained by Bio-Si content in the surface sediment. As a result, Shido Bay determined Si regeneration to be a consequence of Bio-Si dissolution depending on temperature and salinity. This fact suggests that Si flux variations depend largely on the sediment of Bio-Si content, which could be a consequence of the fact that Bio-Si regeneration takes place mostly at the sediment-water interface. During the investigated period, the net sediment release rates of Si showed that sediment supplied a small fraction of the required Si (11%) in the summer, when the production was high. In sharp contrast to this finding it appears that sediment regeneration of Si during the winter can supply significant proportion of phytoplankton demand (79%). The average of these 7 months of data showed that the recycling of Si in the sediments supplied overlying waters with equivalent to 38% of the primary production Si, requirement by phytoplankton in Shido Bay. 1-118