

# Biogenic Silica Production in Equatorial Pacific Surface Waters from 140°W to 180°E

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The eastern upwelling sector of the equatorial Pacific is one of the world's largest high-nitrate low-chlorophyll (HNLC) regions where growth of siliceous plankton (mainly diatoms) is limited by low iron concentrations and may be further limited by silicon (Si) availability. In the warmer waters of the western equatorial Pacific, rates of biogenic silica production are also depressed by low Si concentrations. Although Si dynamics are well characterized in the eastern equatorial Pacific, there is little information on diatom productivity and Si cycling across the biogeochemical gradient extending from HNLC waters in the east to the warm pool of the western Pacific.

The goal of this study was to examine E-W variations in Si cycling and the productivity of siliceous plankton in surface waters of the equatorial Pacific. We measured biogenic silica (BSi) and silicic acid ( $\text{Si}(\text{OH})_4$ ) concentrations, and rates of  $\text{Si}(\text{OH})_4$  uptake with the  $^{32}\text{Si}$  radioactive tracer at 6 depths in the euphotic zone. These data were used to estimate gross and net biogenic silica production rates, silica dissolution rates, Si limitation and the kinetics of Si uptake by siliceous plankton.

The following were the main conclusions from this study:

- There were large E-W differences in the productivity of siliceous plankton and Si dynamics in surface waters within the equatorial band
- HNLC surface waters in the eastern Pacific were characterized by higher rates of gross silica production and higher BSi concentrations compared to the western equatorial Pacific (Fig. 1).
- The HNLC region showed net production of biogenic silica, while dissolution completely surpassed gross silica production in the euphotic zone of the western region.
- In the west equatorial Pacific, there was a large net imbalance in and loss of BSi from the euphotic zone. This imbalance extended down to 300 m.
- Data indicate Si limitation by siliceous plankton occurred within the entire area, with limitation most severe in the western equatorial Pacific.
- These results imply greater potential for Si export in HNLC waters than in the western region, although siliceous plankton appear to contribute very little to the downward flux of silica and other nutrients within the entire study area

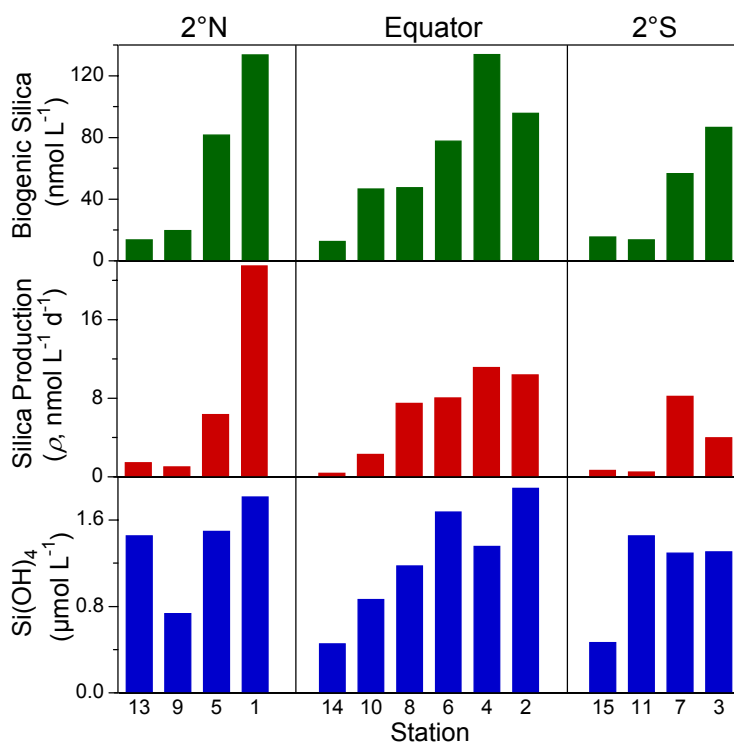


Figure 1. Euphotic-zone averages for biogenic silica concentrations and production rates, and silicic acid concentrations for the EUCFe cruise in Aug-Sep 2006. Each panel shows data (bars) from stations that extended from the east (right side of each panel = lower station numbers) to the west (left side of each panel = larger station numbers) equatorial Pacific.