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Dissolution of biogenic silica frustules of Southern Ocean diatoms at low temperatures

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The $bSiO_2$ ooze of the Southern Ocean (S.O) has long provided a source of discussion over how and why such thick accumulations exist underlying a region of relatively low diatom productivity. The low temperatures and high nutrient conditions of many regions of the S.O are understood to be optimal for *Fragilariopsis kerguelensis*, a slow growing diatom with a high silicate (Si), yet low iron requirement, thus making it a dominant species in the surface ocean of this region. The high level of silification and robust characteristics of *F.kerguelensis* has been hypothesised as being a main factor contributing to its persistence in the sediments of the S.O. However, specific dissolution characteristics of this species have not previously been elucidated, nor have the effects that temperature and aggregation might have in determining the diatom composition of deep ocean sediments.

Laboratory experiments tested the hypothesis that the rate of $bSiO_2$ dissolution of aggregated *F.kerguelensis* is lower than that of the less silicified *Chaetoceros debilis*. The effects of temperature and physiological stage of the cells on the dissolution rate of freshly aggregated cells was also investigated. Four experiments were undertaken; one with *F.kerguelensis* at 5º C, one with senescent *C.debilis* at 5º C, one with senescent *C.debilis* at 15º C, and one with exponentially growing *C.debilis* at 5º C. Aggregates were formed in rolling tanks and Si dissolution monitored for ∼4 months. $bSiO_2$ dissolution was significantly lower for *F.kerguelensis* as compared to *C.debilis* at 5º C. Dissolution of *C.debilis* aggregates formed using exponentially growing cells started with a lag period of ∼1 week in comparison to those formed using senescent cells,

and dissolution increased markedly with temperature.