Calcium carbonate precipitation by the marine cyanobacterium *Trichodesmium*

SVEN A. KRANZ*, DIETER WOLF-GLADROW, GERNOT NEHRKE, GERALD LANGER AND BJÖRN ROST

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (*correspondence: Sven.kranz@awi.de, Dieter.Wolf-Gladrow@awi.de, Gernot.Nehrke@awi.de, Gerald.Langer@awi.de, Bjoern.Rost@awi.de)

Cyanobacteria are important primary producers of the contemporary oceans and have affected global biogeochemical cycles over geological timescales. The diazotrophic *Trichodesmium spp*. are known for their large-scale blooms and substantial input of 'reactive nitrogen' to the oligotrophic subtropical and tropical areas. In this laboratory study, we monitored the buildup of biomass and concomitant shift in seawater carbonate chemistry over the course of a *Trichodesmium* bloom under different phosphorus (P) availability. During exponential growth, dissolved inorganic carbon (DIC) decreased while pH increased until maximum cell densities were reached. Once P became depleted, DIC decreased even further and total alkalinity (TA) dropped, accompanied by precipitation of aragonite. Under P-replete conditions, DIC increased and TA remained constant in the post bloom phase while no aragonite was formed. A diffusion-reaction model was employed to estimate changes in carbonate chemistry of the diffusive boundary layer of an aggregate of *Trichodesmium*. This study demonstrates that *Trichodesmium* can induce precipitation of aragonite from seawater and further provides possible explanations about underlying mechanisms.

Parental melts of Avachinsky volcano (Kamchatka) recorded in melt inclusions

S. KRASHENINNIKOV[1]* AND M. PORTNYAGIN[1,2]

[1]V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry, ul. Kosygina 19, Moscow 119991, Russia (*correspondence: spkrasheninnikov@mail.ru)

[2]Leibniz Institute of Marine Research, IFM-GEOMAR, Wischhofstrasse. 1-3, D-24148 Kiel, Germany

We studied ca. 700 melt inclusions (MIs) in 6 major minerals (Ol, Opx, Cpx, Pl, Amph and Mt) from 61 Holocene andesitic and basaltic andesites tephra of Avachinsky volcano erupted during the last 10 ^{14}C ky.

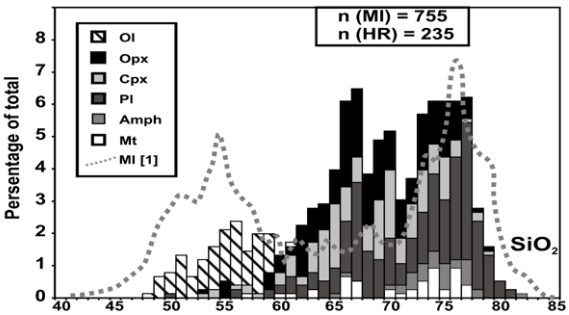

Figure 1: MIs compositions in Avachinsky tephra depending on host mineral phase. Dotted line – compilation of MIs from island-arc rocks after [1].

MIs have low-K to middle-K basaltic to rhyolitic compositions (fig. 1). The continuum of MIs can be well explained by fractional crystallization from parental basaltic melts. No apparent bimodality is observed in the dataset in comparison with [1, 2]. Melts of intermediate compositions are abundant and commonly found in minerals from basaltic andesites. In comparison with the host rocks, MIs have systematically more silicic compositions, and this difference increases with increasing SiO_2 content in the host rocks. Dacitic and rhyolitic MIs predominate in our dataset due to the prelevance of basaltic andesites and andesites on Avachinsky volcano.

These results show that the previously reported bimodality of MIs in island-arc rocks [1, 2] may result from unrepresentative sampling and does not reflect true volume proportions of melts with different SiO_2 content in island-arcs.

[1] Reubi & Blundy (2009) *Nature* **461**(7268) 1269–1273.
[2] Naumov *et al*. (1997) *Petrology* **5**, 586–596.