Trophic transfer of methylmercury in a simple food chain

A.C. LUENGEN[1,3]*, N.S. FISHER[1] AND B.A. BERGAMASCHI[2]

[1]SOMAS, Stony Brook Univerisity, Stony Brook, New York 11794-5000
[2]USGS Water Science Center, Sacramento, CA 95819-6129
[3]Present Address: Environmental Sciences Department, University of San Francisco, San Francisco, CA 94117 (*correspondence: aluengen@usfca.edu)

In previous laboratory experiments assessing the influence of naturally occurring dissolved organic matter (DOM) from the San Francisco Bay Delta on methylmercury (MeHg) bioavailability, we found that phytoplankton accumulation of MeHg was inversely proportional to the DOM concentration over a natural range of DOM concentrations. The goal of this experiment was to determine if the differences in MeHg concentrations in phytoplankton would be passed on to amphipods (*Hyalella azteca*) consuming those phytoplankton. We exposed the diatom *Cyclotella meneghiniana* to MeHg for 24 hours in water with (10 mg L^{-1}) or without organic matter from Mandeville Tip in the Delta. Radiolabeled cells were then resuspended into unlabeled fresh water (to minimize potential for amphipods to take up MeHg from the dissolved phase). Amphipods were fed radiolabeled cells for 35 minutes and then fed unlabeled algae during depuration. We followed the depuration of MeHg from the amphipods for 96 hours. Amphipods feeding on phytoplankton from the high DOM treatments initially accumulated less MeHg than amphipods feeding on phytoplankton from the no DOM treatment. However, assimilation efficiencies of ingested MeHg in the amphipods were around 65-70% for both treatments and MeHg retention in amphipods was unaffected by DOM. The results suggest that DOM decreases the amount of MeHg that can be accumulated in aquatic food chains by influencing the amount taken up from water by phytoplankton but not by influencing the trophic transfer process itself.

Redistribution of elements and isotopes in silicates by diffusion of dissolved water in a T gradient

C.C. LUNDSTROM[1] AND I. BINDEMAN[2]

[1]Dept. of Geology, Univ. of Illinois Urbana Champaign, Urbana, IL 61801 (lundstro@uiuc.edu)
[2]Dept. of Geology, Univ. of Oregon, Eugene, OR 97403

The formation mechanisms of differentiated igneous rocks and continental crust remain debated. While partial melting and fractional crystallization clearly play a role, are they the whole story? Recent experiments (all at 0.5 GPa) examining the behavior of wet silicates in a temperature gradient suggest another important mechanism for forming silicic materials: diffusive transport of silica through water rich but undersaturated melts in a temperature gradient.

Huang *et al*. (GCA, 73, 729–749 2009) showed that AGV-1 andesite with 4% H_2O in a large temperature gradient from 950 to 350°C evolved to a crystalline granitic composition at the cold end of the gradient. New experiments have been performed on RGM-1 (rhyolite) and BCR-1 (basalt) compositions. RGM-1 contained 4 wt% water in a welded double capsule and lasted 25 days. The run product consisted of an all glass upper third, a prominent plagioclase only layer in the middle and a bottom third consisting of mostly quartz plus muscovite. In contrast, two BCR-1 experiments had no water added (run in graphite capsules) and were run for variable times (7 and 45 days). Although mineral layering (of OPX, GT and CPX) occurred in the 45 d experiment, its lower third had little compositional change nor enrichment in silica. We attribute the differences in silica enrichment at the cold ends of these experiments to reflect the transport of components through a hydrous melt in a temperature gradient.

The AGV-1, RGM-1 and one of the BCR-1 charges were analyzed for $\delta^{18}O$ and D/H by new methods developed at Oregon. Despite almost entirely crystalline cold ends, the AGV-1 and RGM-1 charges show dramatic changes in $\delta^{18}O$ and D/H consistent with thermal diffusion isotopic fractionation occurring as water diffused through the charge. $\delta^{18}O$ steadily increases down temperature in each charge with total offsets between the cold and hot ends of 18‰ (AGV) and 28‰ (RGM). The isotopic sensitivity for the AGV charge is the same as found in previous Soret experiments. In contrast, the short BCR experiment shows no significant variation in $\delta^{18}O$. These dramatic differences in isotopic behavior reflect the ability of molecular water dissolved in a silicate melt and subject to a T gradient to move through and rapidly exchange isotopes with coexisting mineral grains.