MIMS Sample Aging Test

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Nov 28, 2017

Short Term MIMS Sample Aging Test

Sample Collection

I collected 50 water samples from LaBonte Pond, Laramie, WY. I collected a 15L bucket full of pond water, gently mixed it, and syphoned out samples into 12mL Exetainers as replicates not independent samples. I recorded temperature and barometric pressure for every 10th sample and gently mixed the water again. Half of the samples were preserved with 0.1 mL $ZnCl_2$ (blue; Fig. 1) and half were not preserved (red). Samples were stored in a 4°C refrigerator, not underwater, until they were analyzed.

Sample Analysis

I measured the change in O_2 and N_2 relative to Ar at 4 and 12°C on a MIMS. I sampled 5 vials from each treatment on each sampling date (0, 5, 10, 19, 28, and 89 days). The first set of samples were analyzed after approximately two hours of aging.

Figure 1: Adding ZnCl 2 to a MIMS sample. Half of my MIMS samples received the preservative before being stored.

Aging Data Ratios

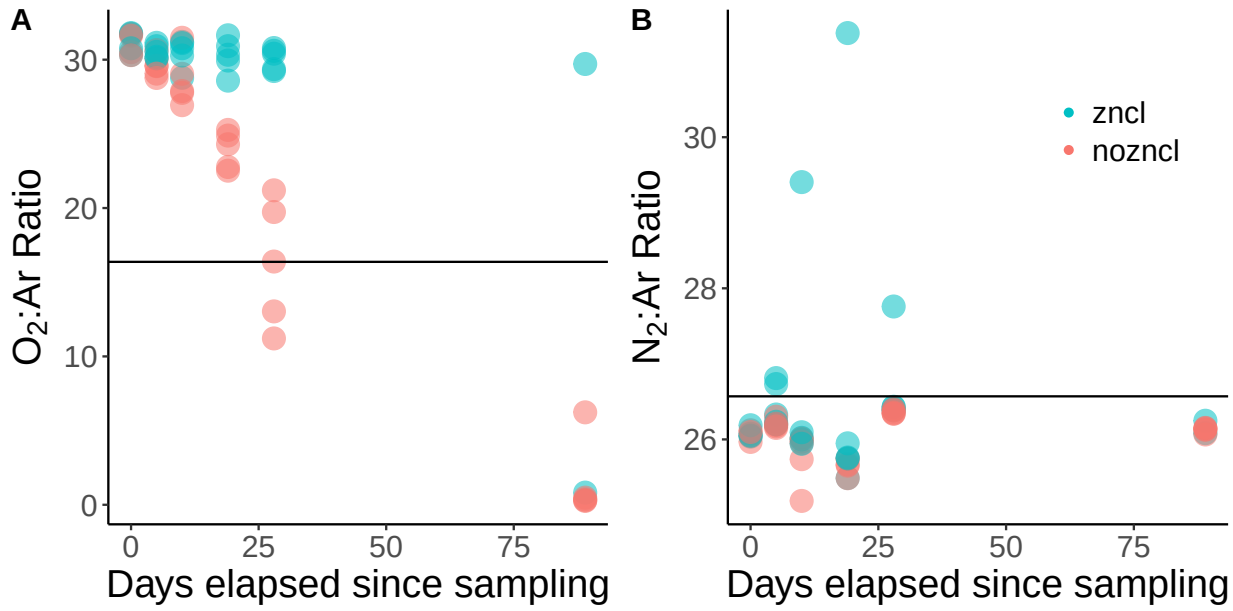

Figure 2: Samples preserved with $ZnCl_2$ maintained their original O_2:Ar ratio for at least a month (A). Further aging only had a sample size of two, but one sample maintained the original O_2:Ar ratio. Samples that were not preserved declined in O_2 throughout the experiment. Because I sampled from a productive lake, the oxygen concentration was high compared to the predicted gas saturation value (horizontal line on the plot). N_2:Ar was largely unaffected by the O_2:Ar ratio changing and presence or absence of $ZnCl_2$ (B). If I were analyzing this data, I would have no qualms about removing the three N_2:Ar ratio values higher than the others because they are outside the biologically expected range for the sample values.

Aging Data Concentrations

I don't recommend using concentrations from the MIMS for analysis. However, if you are interested, I plotted the change in concentrations for treatments with and without $ZnCl_2$.

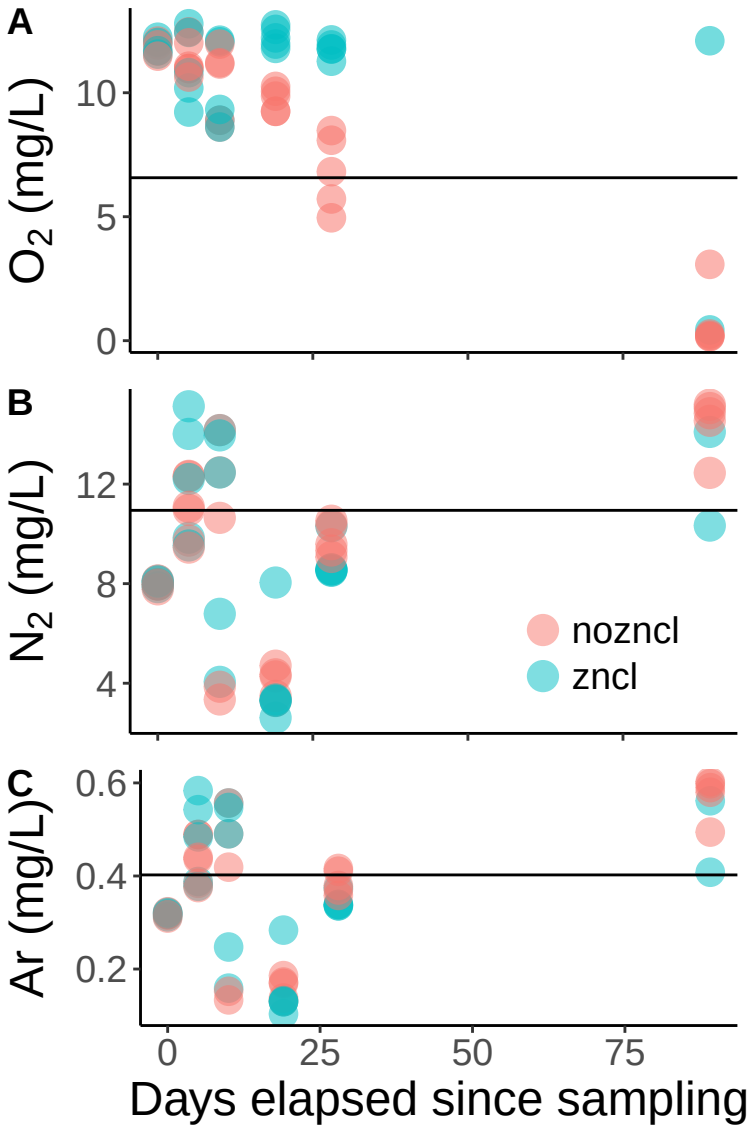

Figure 3: Oxygen concentration declines through time in samples without $ZnCl_2$; however, the ratio of O_2:Ar was cleaner (A). The N_2 concentration varies between sampling dates and within sampling dates (B). Again, the ratio or N_2:Ar was cleaner than the concentrations. Similar to the other concentrations, Ar concentration changed through time (C). Horizontal lines are the predicted saturation values for each gas based on temperature and barometric pressure.

Longer Term MIMS Sample Aging Test

Sample Collection

I collected 20 water samples from Blair Creek, Laramie, WY. I collected a 15L bucket full of stream water, gently mixed it, and syphoned out samples into 12mL Exetainers as replicates not independent samples. I recorded temperature and barometric pressure for every 10th sample and gently mixed the water again. Two thirds of the samples were preserved with 0.1 mL $ZnCl_2$ (blue) and half were not preserved (red). Samples were stored in a 4°C refrigerator, not underwater, until they were analyzed.

Sample Analysis

I measured the change in O_2 and N_2 relative to Ar on a MIMS with water bathes set at 4 and 12°C to calibrate the samples. I sampled 5 vials from each treatment on each sampling date (3, 52, 254, 261, and 292 days). The first set of samples were analyzed after approximately two hours of aging.

Aging Data Ratios

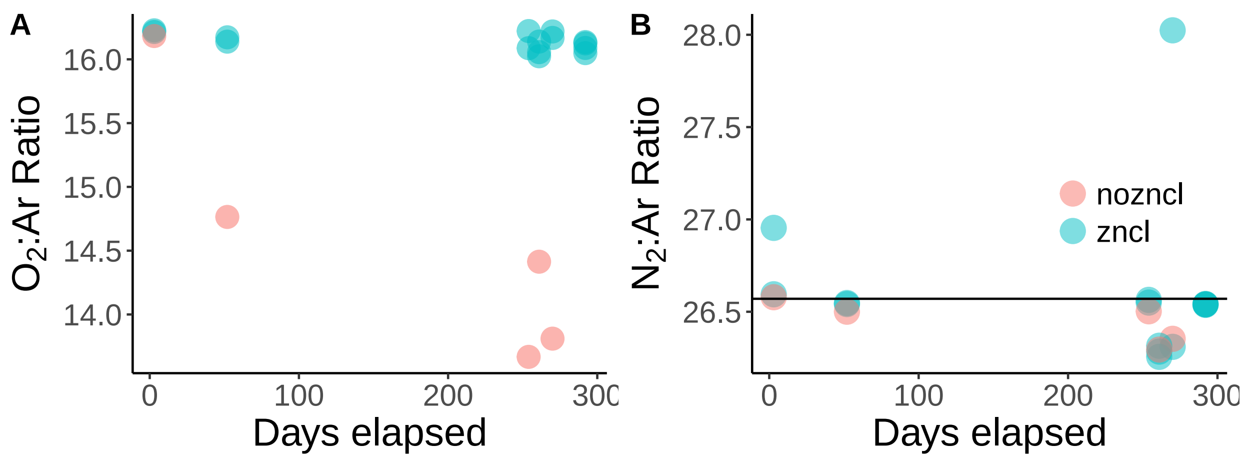

Figure 4: Samples preserved with $ZnCl_2$ maintained their original O_2:Ar ratio for longer than the first aging test, but with smaller sample sizes and more variation by the time they were 300 days old (A). Because I sampled from a low productivity stream, the oxygen concentration was lower than the predicted gas saturation value. N_2:Ar was largely unaffected by the O_2:Ar ratio changing and presence or absence of $ZnCl_2$ (B). If I were analyzing this data, I would have no qualms about removing the two N_2:Ar ratio values higher than the others because they are outside the biologically expected range for the sample values.

Good luck and feel free to ask questions.

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