Southeast Alaska Long-term Seawater Monitoring Program for Ocean Acidification

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Methods

Salinity in surface water (top panel) and pH, pCO2, and chlorophyll a (chla) in surface water (bottom panel). Data were averaged among three inside water sites (Auke Bay, Favorite Channel, and Lena Cove). (chla) in surface water (bottom panel). Data were averaged among three inside water sites (Auke Bay, Favorite Channel, and Lena Cove).

Seasonal cycles in pH, TC, and TA (occurred at all sample depths—surface to 25 m) in the water of Auke Bay, Lena Cove, and Favorite Channel (Fig. 3). The seawater was most basic during December and most acidic during winter. The mean amplitude of the pH cycle in surface water was 0.600. The mean amplitudes for TC and TA in surface water were 896 and 1115, respectively. TA and TC cycles are opposite the pH cycle.

Results

Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.

Continuing Research

- Continue monitoring the carbon parameters in local (inside) water through chemical analysis.
- Expand carbon data collection to a broader area of coastal waters; regional patterns and ecocore data can be better compared.
- Continue monitoring phytoplankton activity as chlorophyll a productivity.
- Improve deep resolution down to 100 m to better describe depth structure.
- Add observation and measurement of dissolved organic carbon in seawater.
- Add atmospheric carbon monitoring to capture local conditions.

Figure 1. River, for the purpose of understanding how terrestrial runoff influences carbonate dissolution, the short-term increase in seawater pH (Fig. 4) was rapid, but slowed with depth. The mean amplitude of the pH cycle in surface water was 0.600. The mean amplitudes for TC and TA in surface water were 896 and 1115, respectively. The TC and TA cycles are opposite the pH cycle.

Figure 2. Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.

Figure 3. Seasonal cycles in pH, TC, and TA (occurred at all sample depths—surface to 25 m) in the water of Auke Bay, Lena Cove, and Favorite Channel (Fig. 3). The seawater was most basic during December and most acidic during winter. The mean amplitude of the pH cycle in surface water was 0.600. The mean amplitudes for TC and TA in surface water were 896 and 1115, respectively. TA and TC cycles are opposite the pH cycle.

Figure 4. Results from the Mendenhall River Yielded similar results.

Discussion

The seawater monitoring data demonstrates pH, total alkalinity (TA), and total dissolved inorganic carbon (TC) have pronounced annual cycles. Auke Creek carbonate chemistry measurements in the winter and summer (Fig. 4) show that seawater pH increased rapidly in winter, and slowed with depth. The mean amplitude of the pH cycle in surface water was 0.600. The mean amplitudes for TC and TA in surface water were 896 and 1115, respectively. The TC and TA cycles are opposite the pH cycle.

Figure 5. The data presented herein primarily outlines the carbon chemistry in coastal waters along the eastern shore of the Gulf of Alaska. The large seasonal carbon changes pose interesting ecological questions for a wide variety of marine species indigenous to these waters. These data also illustrate the need for continued seawater sampling and monitoring of seawater pH, TC, and TA to better describe the long-term changes.

Figure 6. Seawater from Station Aloha, Hawaii, was used to determine the carbon chemistry of seawater of Southeast Alaska. Oceanic seawater from the Gulf of Alaska (Fig. 6) was collected in summer from Mid-Central Alaska (Fig. 1) for the purpose of understanding how terrestrial runoff influences carbonate dissolution, the short-term increase in seawater pH (Fig. 4) was rapid, but slowed with depth. The mean amplitude of the pH cycle in surface water was 0.600. The mean amplitudes for TC and TA in surface water were 896 and 1115, respectively. The TC and TA cycles are opposite the pH cycle.

Figure 7. The data presented herein primarily outlines the carbon chemistry in coastal waters along the eastern shore of the Gulf of Alaska. The large seasonal carbon changes pose interesting ecological questions for a wide variety of marine species indigenous to these waters. These data also illustrate the need for continued seawater sampling and monitoring of seawater pH, TC, and TA to better describe the long-term changes.

Figure 8. Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.

Figure 9. Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.

Figure 10. Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.

Figure 11. Water samples are measured for pH, total alkalinity (TA), total inorganic carbon (TC), and chlorophyll a (chla) content. Auke Creek is a medium-sized urban stream, draining vast urban development, industrial discharge, and residential and agricultural waste from the city of Juneau. It is a major source of freshwater discharge from Mendenhall River in Juneau, and salinity in the seawater is impacted by freshwater discharge.