TITLE: Contrasting controls of pH climatology in an open coast versus urban fjord estuary

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ABSTRACT:

Interactions of physical, chemical, and biological processes in the coastal zone can result in a highly variable carbonate chemistry regime. This characteristic variability in coastal areas has garnered interest within the context of ocean acidification, yet the relative importance of the processes driving this variability is less well characterized. Time scales of these processes vary from hours (production/respiration; tidal exchange) to centuries (anthropogenic fossil fuel emissions), suggesting that management addressing carbonate chemistry variability adopt vastly different strategies. Understanding the relative importance of these processes will help inform future projections of coastal zone carbonate climatology.

To investigate the relative importance of processes affecting coastal carbonate chemistry variability, we present time series data from two contrasting Pacific Northwest estuaries – Yaquina Bay, OR and the Snohomish Delta, WA. Yaquina Bay is a small, strongly ocean dominated estuary, while the Snohomish Delta is a bay in central Puget Sound. We examine an eleven-year long time series of pH in Yaquina Bay, OR for processes influencing seasonal and interannual pH variability. Additionally, we contrast shorter, high temporal resolution time series of dry season pH and pCO_2 from both systems to compare the relative importance of terrestrial/riverine and marine forcings to carbonate chemistry variability. We hypothesize that coastal ocean processes, including upwelling, dominate the pH signal in Yaquina Bay, while local biological processes, partially fueled by riverine delivery of nutrients and organic matter, are more important to Snohomish Delta pH variability. Understanding the differences in dominant drivers among estuaries may inform the application of water quality management tools (e.g. watershed management, carbon reductions) in response to localized carbonate problems.