Nearshore high-frequency pH dynamics in Kachemak Bay, Alaska

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1. INTRODUCTION
Ocean acidification is expected to have deleterious impacts to marine fauna, especially in high-latitude environments. Understanding the natural variability in pH dynamics, particularly in nearshore habitats, is an important step in establishing baseline data for future comparisons and to provide ecological context for manipulative ocean acidification experiments. This research is one of the first high-frequency, annual pH dataset from Alaska’s nearshore habitats.

2. APPROACH
Kachemak Bay is a biologically diverse, high-latitude estuary in the northern Gulf of Alaska (fig. 1). Two SeaFET autonomous pH sensors (co-deployed with salinity and oxygen loggers) were deployed October 2017 – December 2018 at two sites - Bear Cove and Jakolof Bay. A single-point pH calibration sample was collected from each site after deployment and analyzed for pH₄ following Standard Operating Procedures¹. Multiple reference samples were collected post-deployment to determine pH uncertainty. All sensors collected measurements at a 3-hour frequency. pH was calculated using in-situ temperatures using CO2Calc². A total of 14 months of high-frequency pH data was collected from each site.

3. CONCLUSIONS
o Jakolof Bay experienced greater pH variability throughout the summer and fall than Bear Cove as monthly mean standard deviations are greater than 0.1 pH units 4 months out of the year compared to 1 month for Bear Cove.
o Seasonal timing of pH variability differed between the two sites. Bear Cove saw maximal variability in May while Jakolof Bay experienced it in September.
o Primary productivity (oxygen concentration as proxy) was largely responsible for peak pH values in summer and fall.
o From September through December, Bear Cove average pH was 7.85, with episodic events measuring < 7.73.

References: