High-resolution biogeochemical monitoring along three types of coastal interface ecosystems in the Pacific Northwest

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The coastal zone connects terrestrial, freshwater, and marine ecosystems and is a critical component of the global carbon cycle. Processes occurring along the coastal interface are dynamic in nature due to the interplay between tidal and day/night cycles. As such, high resolution data is needed to understand temporal variability in biogeochemical parameters of interest. Here we examine a suite of key parameters for understanding aquatic metabolism and carbon fluxes (i.e., pH, dissolved O_2 (DO), fluorescent dissolved organic matter (fDOM), and Chlorphyll-a) measured on a 15 minute frequency in three types of tidally-influenced settings in the Pacific Northwest: 1) a “tidal river” where water depth changes semi-diurnally with little to no salinity signal, 2) an “estuarine river” where both tides and salinity intrude up into the river channel semi-diurnally, and 3) a “nearshore marine coastal zone” where salinity varies minimally throughout the tidal cycle. In most cases greenhouse gases (e.g. CO_2, CH_4, and N_2O) were measured less frequently to search for correlations with sensor data. For example, pCO_2 often correlated negatively with pH, and interestingly pN_2O correlated positively with conductivity in the case of the tidal river. In general pH and DO varied both due to day/night and semi-diurnal tidal cycles in all three types of systems to varying degrees. Day/night and seasonal variability exerted the largest control on pH and DO at the nearshore marine site, tidal variability exerted the most control on pH and DO at the estuarine river site, and storm pulses exerted the largest control on pH and DO at the tidal river site. Our preliminary evaluation of these results suggest a need to place nodes and interpret data from aquatic monitoring networks in a more integrated manner to begin to identify common trends across ecosystem types, particularly in the complex transition zone between land and sea where tides play variable roles in controlling biogeochemical dynamics.