

Deconvolving Tidal Transport and Daily Production/Grazing Cycles in Concentration Fluctuation Patterns of Four Major Diatom Taxa with Imaging FlowCytobot in Harpswell Sound, Maine

Research shows that phytoplankton blooms occur from an imbalance between population growth and mortality due to changing variables such as nutrient availability and grazing pressure, but the ecological regulators on coastal phytoplankton abundance remain difficult to deconvolve in situ. Still, we need to understand the influences on coastal phytoplankton abundance, given how they contribute substantially to CO₂ drawdown and O₂ production and fuel ecosystems humans rely on. We have found two major influences on cell concentration that operate on varying temporal and power scales, depending on taxa.

We examined the most abundant and well-studied phytoplankton, known for their glass cell walls: diatoms. This class exhibits distinct temporal variations in composition and concentration in coastal waters, which are observable thanks to recent advancements in automated microscopy. Continuous use of an inline Imaging FlowCytobot beginning in 2020 at the Bowdoin Coastal Studies Center in Harpswell, Maine, U.S.A., has recorded diatom bloom events and concentration fluctuations in detail, measuring diatom genera abundance twice per hour. We used Fourier analysis to produce spectrograms that show the period and power of the cycles that influence *Skeletonema* spp., *Thalassiosira* spp., *Cylindrotheca* spp., and *Chaetoceros* spp. abundance most strongly over time.

Our results indicate that the 12-hour-25-minute tidal cycle and daily production and grazing cycles influence diatom genera abundance to different degrees, even over the same time interval. For instance, in mid-June of 2021, the temporal pattern for *Skeletonema*