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Using Machine Learning to Predict Phytoplankton Blooms in the Salish Sea

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Phytoplankton blooms are natural phenomena. A strong bloom occurs every spring in many regions, under specific atmospheric conditions and the presence of nutrients in the water, both of which favor the creation of blooms. As phytoplankton are essential for ocean ecosystems, due to their role as a food source for marine life (and eventually for humans), their accurate and well-timed prediction is crucial. In this paper, we present a machine-learning approach to emulate phytoplankton blooms in the Salish Sea. By using atmospheric drivers as external input features, the models can efficiently emulate phytoplankton biomass and production rates. The phytoplankton variables are outputs of a deterministic model, which is forced by the atmospheric drivers used. Due to the different nature of the phytoplankton variables, different types of machine learning approaches are needed, in addition to different atmospheric drivers that are used as inputs to the models.

Of the 7 atmospheric drivers used to force the deterministic model, sunlight is the most important, as it is used in almost all sub-regions and models. Wind speed, although frequently cited as an important driver for phytoplankton blooms, is only significant for the diatom production rate emulation.