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Statistical analysis of E. huxleyi bloom dynamics driven by atmospheric and oceanic factors in polar and subpolar regions

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In our previous studies of Emiliania huxleyi blooms based on satellite data for the period 1998-2016 (the era of modern high-quality ocean colour sensors, starting from SeaWiFS) we found many salient features of their intensity dynamics and estimated the total Particulate Inorganic Carbon (PIC) content as well as changes in dissolved CO_2 partial pressure in surface water driven by these blooms.
In a wide range of studies on Emiliania huxleyi blooms performed so far, there were many attempts to set linkages between these blooms and the factors controlling the spatio-temporal variations of the phenomenon extent and intensity. In this regard, frequently were considered the North Atlantic Oscillation and other atmospheric indices, water temperature and salinity values, ratio of nutrient concentrations in water and their depletion, etc.
But as far as we know, there were no comprehensive studies focused on a statistical determination of the entire spectrum of bloom conditioning factors. Importantly, neither there was any evaluation of every factor's significance in overall process of blooms formation. In this report results of such a comprehensive statistical study are presented for the period 1998-2016, including the determined statistical relationship/regression between characteristics of each bloom and the atmospheric and oceanic parameters included in our study.
Another perspective direction of the E. huxley blooms data analysis is the use of various machine learning methods both to hindcast blooms and their intensities for cases when there were no satellite ocean colour data (due to cloudiness, for example), and to perform future projections using data from climate models. We thereby report on the work performed to qualitatively assess the predictions of bloom presence using artificial neural networks on the basis of existing reliable data over the period 1998-2016.