High frequency measurements of various water characteristics and nutrients information of the Marel-Carnot sea monitoring station (Boulogne-sur-Mer, France) have been used to identify a physiological model for phytoplankton bloom through the fluorescence signal. An auto-regressive-moving-average with exogenous inputs (ARMAX) model is designed and tested based on the dataset. The model takes into account the effect of the measured water characteristics and nutrient level information. Through this study, it is demonstrated that the developed dynamical model can be used for estimating the fluorescence level (which characterises the phytoplankton biomass) and for predicting the various states of phytoplankton bloom. Thus, the developed model can be used for monitoring phytoplankton biomass in the water which in turn might give information about an unbalanced ecosystem or change in water quality.