FORECAST OF CHLOROPHYLL-A CONCENTRATION BASED ON TIME SERIES DECOMPOSITION AND DEEP LEARNING OVER EUTROPHIC LAKES

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Lake eutrophication has become a serious challenge facing the world. Forecast of chlorophyll-a concentration is essential for water environment risk control in eutrophic lakes. This study developed an effective method for the change trend forecast of chlorophyll-a concentration over eutrophic lakes based on Seasonal and Trend decomposition using Loess (STL) and long short-term memory (LSTM). The proposed method was applied in a typical eutrophic lake (Lake Taihu, China) and was compared with two commonly used machine learning methods (random forest, RF; support vector machine, SVM). The results showed that the STL model can effectively remove the noise in long-term monitoring data, and obtain the long-term change trend of chlorophyll-a concentration. Based on the STL time series decomposition results, the future change trend results of chlorophyll-a concentration in Lake Taihu were forecasted by LSTM and two machine learning methods (RF and SVM). The LSTM method largely outperformed the methods of RF and SVM, with the smallest root mean square error as well as the largest correlation coefficients Nash-Sutcliffe and efficiency coefficient. In particular, the LSTM method can well capture the large peak values of chlorophyll-a concentration in summer months, which are more important to the risk management of algal blooms.