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Prediction of Chl-a concentrations in an eutrophic lake using ANN models with hybrid inputs

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Chlorophyll-a (Chl-a) concentrations in water bodies exhibit both spatial and temporal variations. As a result, frequent sampling is required with higher number of samples. This motivates the use of remote sensing as a monitoring tool. Yet, prediction performances of models that convert radiance values into Chl-a concentrations can be poor in shallow lakes. In this study, Chl-a concentrations in Lake Eymir, a shallow eutrophic lake in Ankara (Turkey), are determined using artificial neural network (ANN) models that use hybrid inputs composed of water quality and meteorological data as well as remotely sensed radiance values to improve prediction performance. Following a screening based on multi-collinearity and principal component analysis (PCA), dissolved-oxygen concentration (DO), pH, turbidity, and humidity were selected among several parameters as the constituents of the hybrid input dataset. Radiance values were obtained from QuickBird-2 satellite. Conversion of the hybrid input into Chl-a concentrations were studied for two different periods in the
lake. ANN models were successful in predicting Chl-a concentrations. Yet, prediction performance declined for low Chl-a concentrations in the lake. In general, models with hybrid inputs were superior over the ones that solely used remotely sensed data.