Forecasting of dinoflagellate blooms in warm-monomictic hypertrophic reservoirs in South Africa by means of rule-based agents

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Abstract

The occurrence of large blooms of Dinoflagellates composed primarily of *Ceratium hirundinella,* in hypertrophic reservoirs in South Africa has become more pronounced since 1999. The financial and operational impact of these blooms on the drinking water industry is high as this species produces bad tastes and odours and clogs filters.

In order to enable real-time forecasting for dinoflagellate blooms a hybrid evolutionary algorithm rule set for hypertrophic reservoirs in South Africa was developed. Data from three known hypertrophic systems were used for training and developing the rule set. Testing was done on two years respectively from the same reservoirs as the training data. The rule set was also tested on unseen data from two other hypertrophic reservoirs that are known to experience dinoflagellate blooms.

The results show that the developed rule set predicts real-time dinoflagellate blooms quite accurately and the sensitivity analysis showed that the rule set developed on hypertrophic reservoirs in the summer rainfall and temperate region of South Africa, is applicable to reservoirs within the same climatic region and of the same hypertrophic status

Keywords: rule-based agents, hybrid evolutionary algorithms (HEA), Dinoflagellates, *Ceratium*, hypertrophic warm-monomictic lakes