Anabella FERRAL, Velia SOLIS, Alejandro FRERY, Alejandro ORUETA, Ines BERNASCONI, Javier BRESCIANO, Carlos M. SCAVUZZO

SPATIO-TEMPORAL CHANGES IN WATER QUALITY
IN AN EUTROPHIC LAKE WITH ARTIFICIAL AERATION

Abstract

In this work we present novel results concerning water quality changes in an eutrophic water body connected with an artificial aeration system installed in it. Sixty one in-situ and laboratory measurements of biogeochemical variables were recorded monthly between October 2008 and June 2011 to evaluate temporal and spatial changes in San Roque reservoir (Argentina). t-Student mean difference tests, carried out over the whole period, showed with 95% confidence that a monitoring point located at the centre of the water body is representative of the chemical behaviour of the reservoir. Thermal stratification was observed in all sampling sites in the summer, but the frequency of these episodes was markedly lower in bubbling zones. Mean chlorophyll-a concentrations were 58.9 µg·dm^{-3} and 117.0 µg·dm^{-3} in the absence and in the presence of thermocline respectively. According to the t-Student test, this difference was significant, with \( p < 0.001 \). Phosphate release from sediments was corroborated under hypoxia conditions. ANOVA one way analysis did not show significant spatial differences for any variable. Mean normalize spatial index (MENSI) was developed to compare data from different regions affected by high temporal variability. It proved to be useful to quantify spatial differences. Structure analysis of temporal series was used to scrutinize both chemical and spatial association successfully. Three chemically different zones were determined in the reservoir. This study demonstrated that spatial comparisons by means of marginal statistics may not be an adequate method when high temporal variation is present. In such a case, temporal structure analysis has to be considered.

Key words: eutrophication, phosphates, projection techniques, statistical analysis, thermal stratification, time series, water quality