

# Unraveling the Lagged Effect of Hydro-meteorological Conditions On the Trophic State of a Reservoir By Applying Dynamic Regression

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## Resumen

In this study we develop a novel approach to quantify the relative importance of hydro-meteorological (HM) conditions on the trophic state index (TSI) of a water reservoir (San Roque, Córdoba, Argentina). Seven HM variables measured at four reservoir sites and different depths over a time period of near 2 decades are used. We propose a dynamic regression model to predict the TSI from these variables aggregated over a range of time lags, which has not been applied in such a complex setting so far. By performing coefficient analysis, we quantify the relative importance of these variables on the TSI, as well as the time duration over which they have significant impact (lagged effect). Additionally, the analysis of the autoregressive and moving average (ARIMA) terms reveals the impact of the residual effects of previous trophic states on the current trophic state. We find that surface temperature and precipitation have the largest direct

relationship to the TSI in the short-term, while the reservoir water level is inversely related to the TSI in the short- to mid-term. Also, the residual effects of the trophic state impact from 1 month (generally) up to 2 years (exceptionally). This approach can be applied to other water bodies affected by similar eutrophication phenomena. Graphical abstract: [Figure not available: see fulltext.]

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