



Abstract

# Temporal Evolution of the Cyanobacterial Infestation of the Lalla Takerkoust Dam Revealed by Landsat Satellite Imagery <sup>†</sup>

Richard Mugani <sup>1,2,\*</sup>, El Mahdi Redouane <sup>1</sup>, Mohammed Haida <sup>1</sup>, Fatima El Khalloufi <sup>3</sup>, Alexandre Campos <sup>4</sup>, Vítor Vasconcelos <sup>4,5</sup>, Hans-Peter Grossart <sup>2,6</sup> and Brahim Oudra <sup>1</sup>

- <sup>1</sup> Water, Biodiversity and Climate Change Laboratory, Faculty of Sciences Sémmlalia, Cadi Ayyad University, Av. Prince My Abdellah, P.O. Box 2390, Marrakech 40000, Morocco; redouane.elmahdii@gmail.com (E.M.R.); mohammed.haida11@gmail.com (M.H.); oudra@uca.ac.ma (B.O.)
- <sup>2</sup> Department of Plankton and Microbial Ecology, Leibniz Institute of Freshwater Ecology and Inland Fisheries, 16775 Stechlin, Germany; hanspeter.grossart@igb-berlin.de
- <sup>3</sup> Natural Resources Engineering and Environmental Impacts Team, Multidisciplinary Research and Innovation Laboratory, Polydisciplinary Faculty of Khouribga, Sultan Moulay Slimane University of Beni Mellal, B.P. 145, Khouribga 25000, Morocco; elkhalloufi.f@gmail.com
- <sup>4</sup> CIIMAR—Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros Porto de Leixões, Avenida General Norton de Matos S/N, 4450-208 Matosinhos, Portugal; acampos@ciimar.up.pt (A.C.); vmvascon@fc.up.pt (V.V.)
- <sup>5</sup> Faculty of Sciences, University of Porto, Rua do Campo Alegre, 4169-007 Porto, Portugal
- <sup>6</sup> Institute for Biochemistry and Biology, Potsdam University, 14469 Potsdam, Germany
- \* Correspondence: richardmugani@gmail.com
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- ‡ Presenting author (poster).



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**Abstract:** The Lalla Takerkoust dam in Morocco experiences episodes of cyanobacterial blooms every year. The variation trend of cyanobacterial blooms in this lake was studied. The Normalized Difference Vegetation Index (NDVI), derived from Landsat observations, combined with cyanotoxins, reported in the dam for more than 30 years, from 1990 to 2020, was used to provide a quantified history of the infestation dynamics of the dam water used for crop irrigation and drinking water production. The results showed that the vegetation indices fluctuated significantly over time (Kendall test  $p < 0.001$ ). Summer and autumn were the main seasons for the appearance of cyanobacterial blooms, with higher cyanotoxin concentrations in autumn than in summer, with 159.67  $\mu\text{g/L}$  in November 2020 and 4.79  $\mu\text{g/L}$  in October 2019, respectively. On the other hand, other parameters related to climate change were analyzed to explain the differences in NDVI values over the years. The variation of temperature, quality of the chromatic spectrum, and precipitation seem to contribute to the variation of the NDVI and, consequently, the infestation of algal bloom in the lake. Indeed, in 2010, a year where rainfall was 333.57 mm and the average temperature in October was 18.81 C, we recorded a PAR of 102.84  $\text{W}\cdot\text{m}^{-2}$  with UVA of 11.51  $\text{W}\cdot\text{m}^{-2}$  and UVB of 0.25  $\text{W}\cdot\text{m}^{-2}$ . During this year, NDVI was highest by 0.28, and biomass toxicology was highest at 11.5 mg MCLR $\cdot\text{g}^{-1}$  DW. Ultimately, this study is the first in Morocco that traces a temporal evolution by satellite imaging of the history of the Takerkoust dam infestation. It will allow an awareness of the effects of climate change on the quality of this freshwater resource.

**Keywords:** vegetation index; biomass toxicology; cyanobacteria; cyanotoxin; Takerkoust

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**Data Availability Statement:** Data used here can be publicly accessed on <https://power.larc.nasa.gov/data-access-viewer/> (accessed on 26 January 2022) Lalla Takerkoust dam Morocco.

**Conflicts of Interest:** The authors declare no conflict of interest.