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DEVELOPING INTEGRATED REMOTE SENSING DATA FUSION AND MINING TECHNIQUES FOR ENVIRONMENTAL MONITORING OF THE WATER QUALITY IN SPANISH RESERVOIRS

C. Doña [a, *], V. Caselles [a], N.B. Chang [b], J.M. Sánchez [c], A. Camacho [d]

[a] Department of Earth Physics and Thermodynamics, University of Valencia, Burjassot, Valencia, Spain– Carolina.Dona@uv.es, Vicente.Caselles@uv.es
[b] Department of Civil, Environmental, and Construction Engineering, University of Central Florida, Orlando, Florida, USA– nchang@ucf.edu
[c] Department of Applied Physics, University of Castilla-La Mancha, Almadén, Ciudad Real, Spain – JuanManuel.Sanchez@uclm.es

[d] Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Burjassot, Valencia, Spain – Antonio.Camacho@uv.es

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ABSTRACT:

Encouraged by the enforcement of the European Water Framework Directive in 2000 (WFD), which demands that all EU countries have to monitor and achieve the good ecological status or potential of their water bodies, there is a growing interest in remote sensing techniques to monitor environmental quality variables in surface waters. In this work integrated data fusion and mining (IDFM) techniques are applied to process satellite images to estimate relevant water quality variables in a set of Spanish reservoirs. Data of ground measurements of chlorophyll *a* concentration, total suspended particles and water transparency for the period 2002-2012, were used as ground-truth data set for verification and validation of IDFM technique. Satellite images from Landsat Thematic Mapper (TM), Enhance Thematic Mapper (ETM+) and Moderate Resolution Imaging Spectroradiometer (MODIS) were retrieved to carry out this IDFM study. The high spatial resolution of TM (30 m) makes this sensor very useful to study the spatial variability of the water quality variables, in contrast to MODIS (250/500 m). However, the poor revisit frequency of TM (16 days), compared to the daily MODIS overpasses, might be an obstacle for a near-real time monitoring system. To solve this problem, synthetic Landsat images were generated though MODIS-Landsat data fusion. With the aid of the ground truth database, genetic programming (GP) models were then derived to estimate the different water quality variables from the fused surface reflectance data. With this effort, the water quality in reservoirs may be assessed with high temporal resolution, providing tools for a real-time water quality management.

* Corresponding author. This is useful to know for communication with the appropriate person in cases with more than one author.