Chapter 4
Detailed JavaScript API for Google Earth Engine to Enhance Monitoring of Surface Water Dynamics in the Drought-Affected Mediterranean Region

Adil Moumane
https://orcid.org/0000-0003-0296-2679
University Ibn Tofail, Morocco

Jamal Al Karkouri
University Ibn Tofail, Morocco

Batchi Mouhcine
https://orcid.org/0000-0002-0915-6592
University Ibn Tofail, Morocco

ABSTRACT

This study focuses on monitoring surface water dynamics in the Mediterranean region, a region increasingly grappling with water scarcity. The authors analyzed five dams—Al Massira and Mansour Eddahbi in Morocco, Sidi Salem in Tunisia, Sau Reservoir in Spain, and Cabril Dam in Portugal—using a custom JavaScript API developed for Google Earth Engine (GEE). This API enabled efficient processing of Landsat satellite imagery to calculate annual average water areas and extract representative water body images. The findings reveal significant reductions in water

DOI: 10.4018/979-8-3693-9651-3.ch004

area across all studied reservoirs, underscoring the impact of prolonged drought conditions on water availability in the region. The Al Massira Dam in Morocco experienced the most pronounced decline. This research emphasizes the critical role of advanced remote sensing tools in supporting water resource management and policymaking in the Mediterranean region.

1. INTRODUCTION

Water scarcity is a growing global challenge, with the Mediterranean region experiencing particularly acute pressures due to climate change, increasing population, and intensive agriculture (Achite et al., 2023; Elair et al., 2023; Hakam et al., 2023; Garrido-Perez et al., 2024; Moreno-de-las-Heras et al., 2023; Ramat et al., 2023; Rossi et al., 2023). The Mediterranean's semi-arid climate, combined with variable precipitation patterns and intense seasonal demands, exacerbates the vulnerability of its water resources. Accurate and timely monitoring of surface water bodies is crucial for understanding these dynamics and informing effective water resource management.

Traditional remote sensing methods, such as satellite imagery, have been used to study surface water changes, employing indices like the Normalized Difference Water Index (NDWI) (Gao, 1996) and the Modified Normalized Difference Water Index (MNDWI) (Xu, 2006). These indices help differentiate water bodies from other land cover types by leveraging the spectral properties of water in various bands. However, these methods face challenges in processing large volumes of data and providing timely information. The sheer size of satellite datasets and the computational power required to process them can be prohibitive, especially for continuous and large-scale monitoring efforts.

Recent advancements in cloud-based platforms, particularly Google Earth Engine (GEE), have revolutionized the analysis of satellite imagery, offering unparalleled efficiency and scalability (Tamiminia et al., 2020; Deng et al., 2019; Sur et al., 2021; Wang et al., 2022). GEE's robust computational infrastructure, coupled with its extensive data repository, empowers researchers to rapidly process and analyze massive volumes of geospatial data with precision. This capability is especially transformative for water resource management, enabling detailed monitoring of surface water dynamics across vast spatial extents and fine temporal resolutions (Garnier et al. 2024; Kazemi Garajeh et al. 2024). By leveraging GEE, researchers can now track changes in surface water availability, quality, and distribution with unprecedented accuracy, supporting more informed decision-making in the context of water conservation and management.

A Compilation of Methods and Datasets for Group and Crowd Action Recognition

Luis Felipe Borja, Jorge Azorin-Lopezand Marcelo Saval-Calvo (2017). *International Journal of Computer Vision and Image Processing (pp. 40-53).*
www.irma-international.org/article/a-compilation-of-methods-and-datasets-for-group-and-crowd-action-recognition/188760