FF 21

EUROGEO WORKSHOP 2022

ATHENS 2022 07-09 DECEMBER

UNMANNED VEHICLES COMBINED WITH SATELLITE OBSERVATIONS AS A COMPLEMENT TOOL FOR WATER QUALITY OF LAKE MARATHON

Katsouras G.[1], Konstantinopoulos Sp.[2], De Keukelaere L.[3], Moelans R.[3], Christodoulou C.[4], Bauer Ph.[5], Tsalas N.[1], Hatzikonstantinou P.[2], Lioumbas I.[4], Katsiapi M.[4], Samios S.[1], Sachinis G.[1], Bomans B.[3], Manakos I.[6]

[1]*Athens Water and Sewerage Company S.A (E.Y.D.A.P.) – Oropou 156, 11146, Galatsi, Athens, Greece, gekats@eydap.gr*

[2]*Aerata Aerial Assessment Solutions – Leof. Alimou 8, 174 55, Athens, Greece*

[3]*Flemish Institute for Technological Research NV (VITO) Boeretang 200, BE-2400 Mol, Belgium*

[4]*Thessaloniki Water Supply & Sewerage Company S.A. (EYATH S.A.) - Tsimiski 91, 54622, Thessaloniki, Greece*

[5]*Earth Observation and Environmental Services (EOMAP GmbH & Co. KG) - Castle Seefeld, Schlosshof 4a, D-82229 Seefeld, Germany*

[6]*Centre of Research & Technology, Information Technologies Institute (ITI) 6th km Harilaou - Thermi, 57001, Thermi - Thessaloniki, Greece*

Introduction

The aim of the present study is to highlight the importance of an ***Integrated innovative water quality monitoring strategy***, that leads to more reliable datasets and, hence, allowing the prediction of water quality in a large area of a catchment with higher frequency than traditional sampling methods.

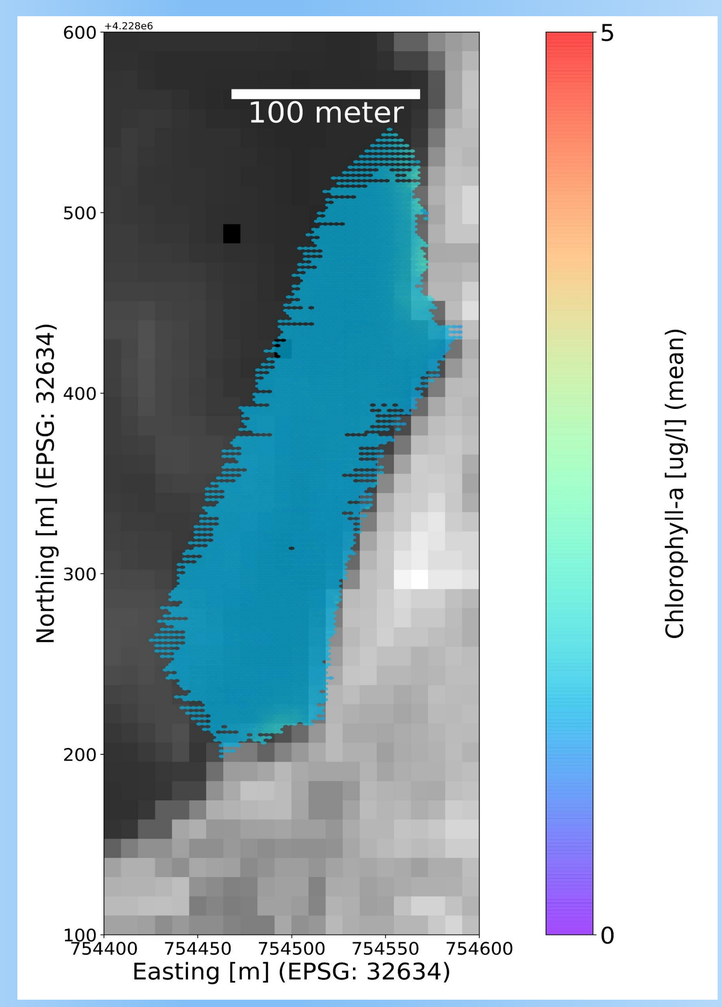

Fig.1: Chl-a concentration (~1 μg/l) along Marathon Dam by UAV on 15/06/22.

Material and Methods

The USV collected more than 10.000 data (chlorophyll-a, conductivity, pH, dissolved oxygen), while the UAV, equipped with MicaSense Dual camera (RGB), recorded thousands of images. The calculation of chlorophyll-a and water turbidity based on spectral approaches utilizing information in the visible and near infrared wavelength ranges (Fig. 1). Processing includes direct georeferencing, radiometric calibration and removal of the atmospheric contribution using an adopted version of iCOR. The satellite data based on Copernicus Sentinel-2 (Fig 2). All the above innovative monitoring strategies were validated with in-situ measurements.

Aim of the study

A demo-campaign took place successfully on the 15th of June 2022 in Lake Marathon, in order to communicate and disseminate innovative technologies and services to the ***Greek Stakeholder Network***. The campaign combined use of ***Unmanned Surface Vehicle*** (USV) and ***Unmanned Aerial Vehicle*** (UAV) developed within the framework of the **INTCATCH** and **MONOCLE** projects respectively. The main goal was the Integrated Management of Water Resources aiming at cleaner water. An extra tool is the ***application of the satellite data*** that offer high temporal and spatial coverage over specific timescales. In this framework, **WQeMS** project, assisted Lake Marathon water quality as complementary monitoring service based on Copernicus Sentinel-2 data.

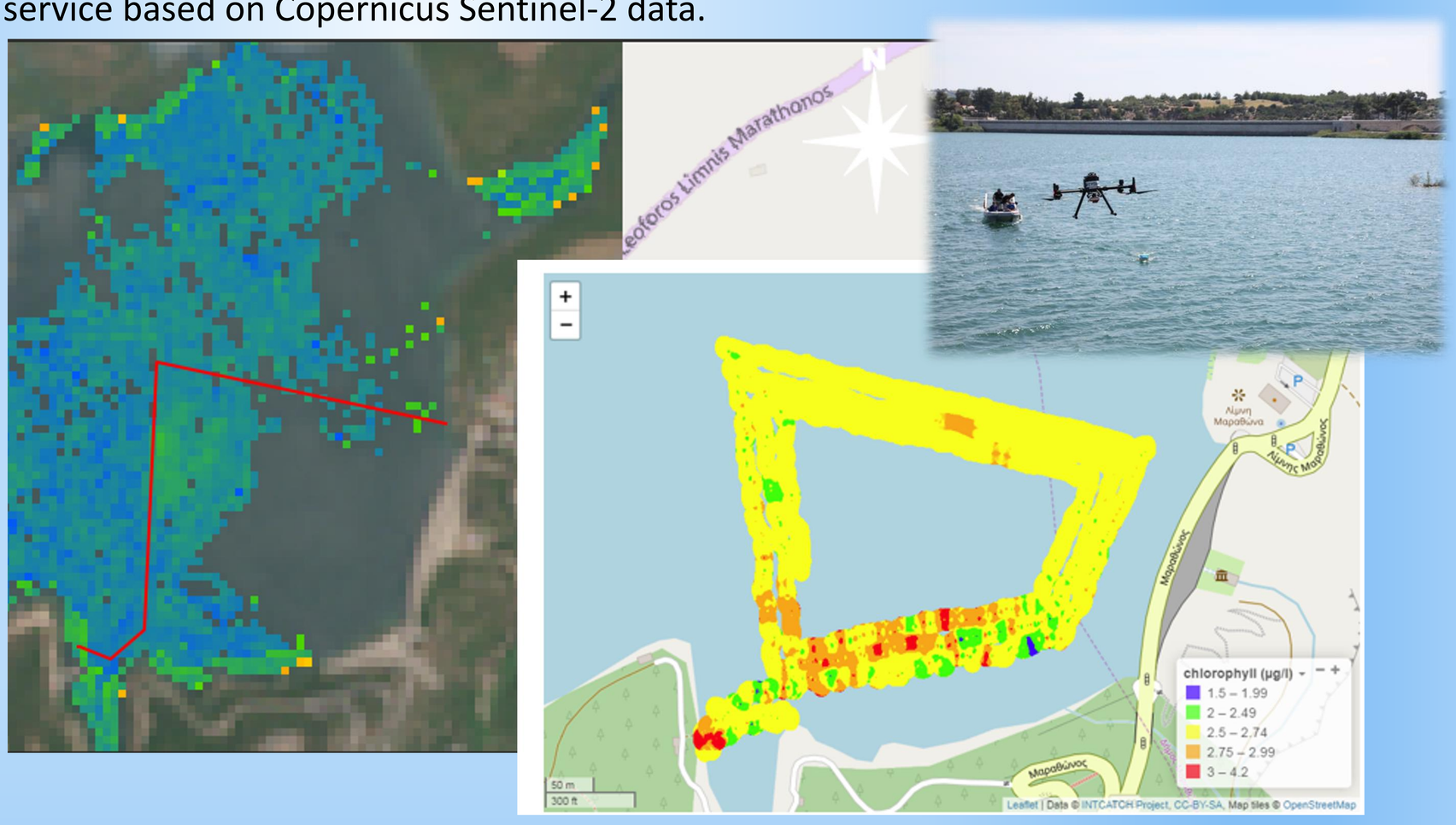

Fig.2: Mean value of chl-a along the drawn red line (2.66 μg/l) from Sentinel-2 capture is equivalent to the yellow line (2.50-2.74 μg/l) in capture provided by EYDAP's USV.

Results and Conclusions

The analysis shows that the real-time results of USV in comparison with the images of UAV and satellite observations are in accordance and can contribute to traditional monitoring programs of inland waters. The more valuable perspectives are that they offer quick and flexible data collection, even from hard-to-reach areas, which can be easily and safely transferred and saved online and can cover a greater part of the study area in minimum time, compared to standard field data collection methods, offering significant improvements in continuous, temporal monitoring.

The results proved the excellent quality of the water in Lake Marathon and that the combination of the above methods can contribute to detecting in time, possible pollution from anthropogenic activities or natural processes..

Acknowledgments

INTCATCH H2020 received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 689341, MONOCLE H2020 received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 776480 and WQeMS H2020 received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 101004157