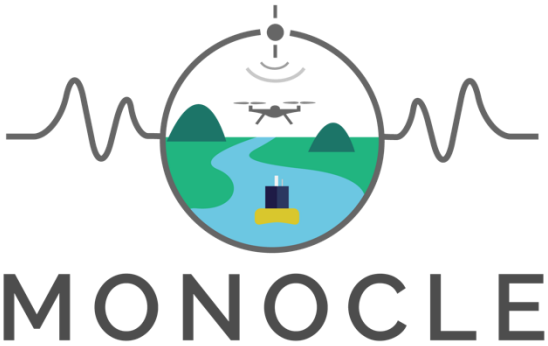
Project	MONOCLE H2020 (grant 776480)	**Start / Duration**	1 February 2018/ 48 Months
Dissemination	PUBLIC	**Nature**	OTHER
Date	30 Jul 2020	**Version**	1.0



Multiscale Observation Networks for Optical monitoring of Coastal waters, Lakes and Estuaries

Deliverable 2.5

D2.5 - Low-cost sensors support package

Project Description

Funded by EU H2020 MONOCLE **creates sustainable *in situ* observation solutions for Earth Observation (EO) of optical water quality in inland and transitional waters.** MONOCLE develops essential research and technology to lower the cost of acquisition, maintenance, and regular deployment of *in situ* sensors related to optical water quality. The MONOCLE sensor system includes handheld devices, smartphone applications, and piloted and autonomous drones, as well as automated observation systems for e.g. buoys and shipborne operation. The sensors are networked to establish interactive links between operational Earth Observation (EO) and essential environmental monitoring in inland and transitional water bodies, which are particularly vulnerable to environmental change.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776480

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1. Executive Summary

To support the use and community development of low-cost sensors developed in the MONOCLE project, software has been developed and stored in public repositories with appropriate licenses. This deliverable can be used as a guide to the location and use of these resources.

2. Scope

Low cost sensor users, (app) developers, MONOCLE Partners, people who are lookikng for low cost sensor integration solutions.

3. Reference

The support tools are documented on the MONOCLE-H2020 Github in the form of a Wiki page, allowing for future updates:

https://github.com/monocle-h2020/low_cost_sensor_support_package/wiki

4. Support tools overview

This overview is a snapshot of the information provided on the Wiki.

SPECTACLE / iSPEX

General description

The spectacle app, scripts and backend are used for smartphone camera calibrations and capture RAW image sensor data along with positional data. The software (both iOS and Android) forms the starting point for building the iSPEX (a smartphone spectropolarimater) app.

Repositories

iSPEX 2 repository (Python):

https://github.com/burggraaff/ispex2

Description

Data reduction scripts (Python) take raw image and metadata from the SPECTACLE app / database.

SPECTACLE Repository (Python):

https://github.com/monocle-h2020/camera_calibration

SPECTACLE App

iOS and Android calibration apps (xcode and android studio development resources) are maintained at:

- IOS https://github.com/monocle-h2020/spectacle_ios
- Android https://github.com/monocle-h2020/spectacle_android

The Mobile back end is used for storage, metadata, push notifications and offline data syncing.

SPECTACLE/iSPEX Back end database dump:

https://github.com/monocle-h2020/spectacle_db

KDUINO/KSTICK

Description

The KdUINO is a low-cost moored system that measures downwelling irradiance at different depths with Kd as an output parameter (more information here:

http://www.citclops.eu/transparency/measuring-water-transparency)

KduProcode:

https://github.com/Carlos-Rodero/KdUINO_Feather?organization=Carlos-Rodero&organization=Carlos-Rodero

Data analysis scripts:

https://git.csic.es/36579996Z/kduino-data-analysis

DRONE support software

Description

The MONOCLE project uses drones with additional payload to perform radiometric measurements above the water. The main software for DJI drones is available from the manufacturer:

https://www.dji.com/nl/ground-station-pro

Sitemark created guidelines for the correct use of the DJI GSPro drone pilot app for scientific data collection over waterbodies. This app works on IOS systems. The flight guidelines are referenced at:

https://github.com/monocle-h2020/low_cost_sensor_support_package/blob/master/Monocle%20Flight%20Guidelinesv1 2020704_update.pdf

To support drone pilots with flight mission planning, Sitemark created a website (MONOCLE Flight Planner) to help define coordinates for the drone to hover in order to capture a certain buoy and in function of the position of the sun.

https://sm-projects-monocle.azurewebsites.net/

FRESHWATER WATCH

FreshWater Watch is a global project which enables individuals and communities to monitor, protect and restore their local water resources.

FreshWater Watch trains people around the world to collect water and analyse water samples from local rivers, lakes, and other bodies of fresh water. The resulting data provides the evidence needed to support efforts aimed at improving water quality.

FreshWater Watch was launched in 2012 as part of the HSBC Water Programme. Since then, Earthwatch has expanded this flagship project to reach volunteers, research organisations, and schools across the world. (https://earthwatch.org.uk/get-involved/freshwater-watch)

The following methods and supporting documents are available to communities interested in setting up FWW activities:

FWW methods description:

https://freshwaterwatch.thewaterhub.org/content/your-test-kit

FWW methods manual:

https://freshwaterwatch.thewaterhub.org/sites/default/files/fww-methods-manual.pdf

FWW health and safety document:

https://freshwaterwatch.thewaterhub.org/sites/default/files/health-and-safety-manual.pdf

FWW site selection info:

https://freshwaterwatch.thewaterhub.org/content/where-test

FWW data upload instructions:

https://freshwaterwatch.thewaterhub.org/content/uploading-results

MONOCLE data obtained with FWW are served using a Geoserver at Earthwatch:

https://geo.earthwatch.org.uk/

5. Further documentation

Software for FWW and Sitemark/Vito procedures are referenced through the links in the Wiki.

All Python/Java/iOS (ObjectiveC) code contains further annotation for developers.