Report by examples about the outputs obtained by querying the GIS for specific topics

Activity 4.3 - Creation of an open access GIS WP4 - Implementation of the Georeferenced Open Access Database

SUSHI DROP project (ID 10046731)

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Abstract

WP4 is focused to UUV mission planning, data acquisition and storage. This WP describes the procedures implemented to build a collection of data organized by biological and ecological interest in the form of thematic maps, 3D models, and geodatabases. The processed data can be visualized using open-source tools such as GIS platforms to reach the public and all project stakeholders. In this report is shown an overview of some GIS examples of results produced with different elaborations performed starting from the data acquired during the SUSHI DROP missions in the Adriatic Sea, near the Croatian coast and near the Italian coast.

Overview

The results of the SUSHI DROP project are published in an Open Data format database and visualized on WebGIS. The data flow starts from the acquisition of data by UUV and arrives at the dissemination of the results (Figure 1).

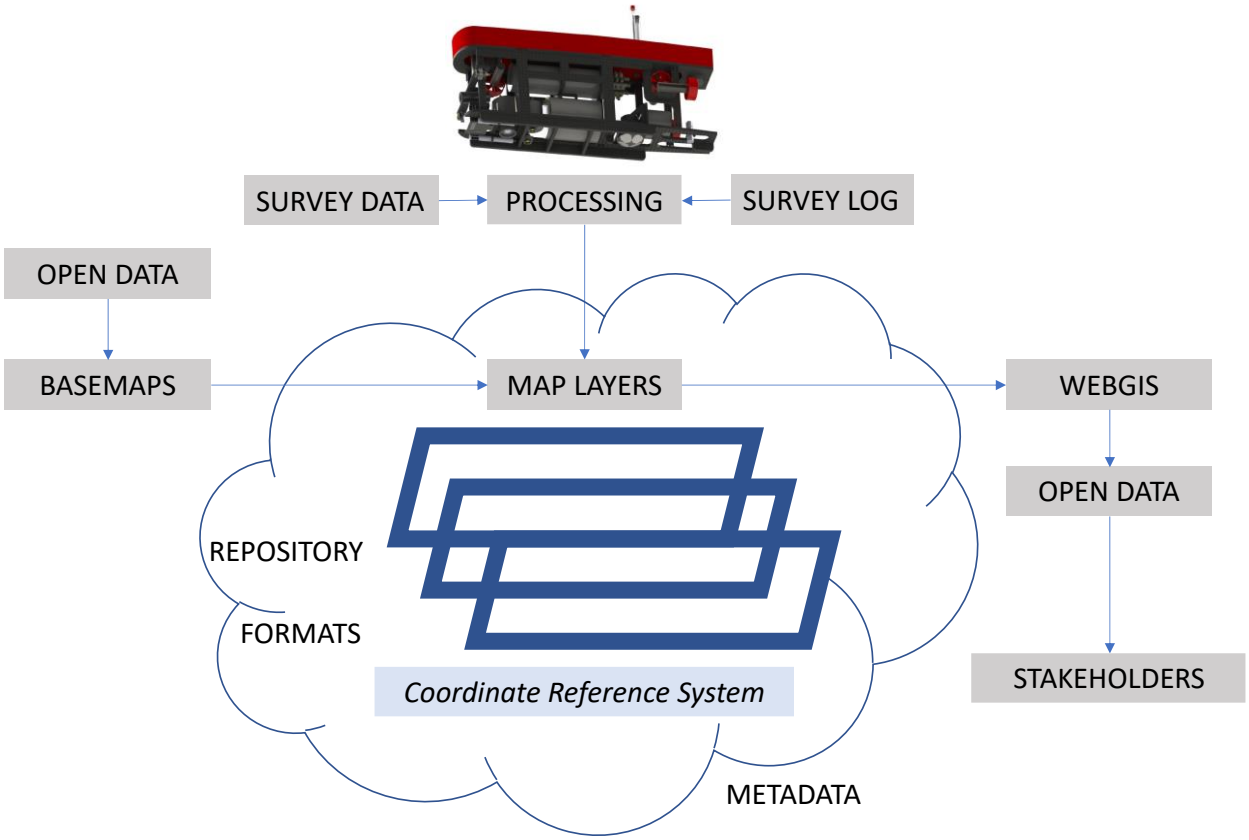

FIGURE 1 - WORKFLOW FOR DATA SURVEYED: FROM UUV TO GIS OUTPUT

Thanks to the final Open Data repository it is possible to reach a wider audience of potential stakeholders. In the following chapter some results visualized in a GIS environment are illustrated through specific examples.

Output examples

The Open Access repository is currently implemented on the Open Science Framework: a free and open platform with the aim of supporting research and enabling collaboration. It is possible to view the structured available data and download all layers freely for consultation or further processing without any registration requirement (Figure 2).

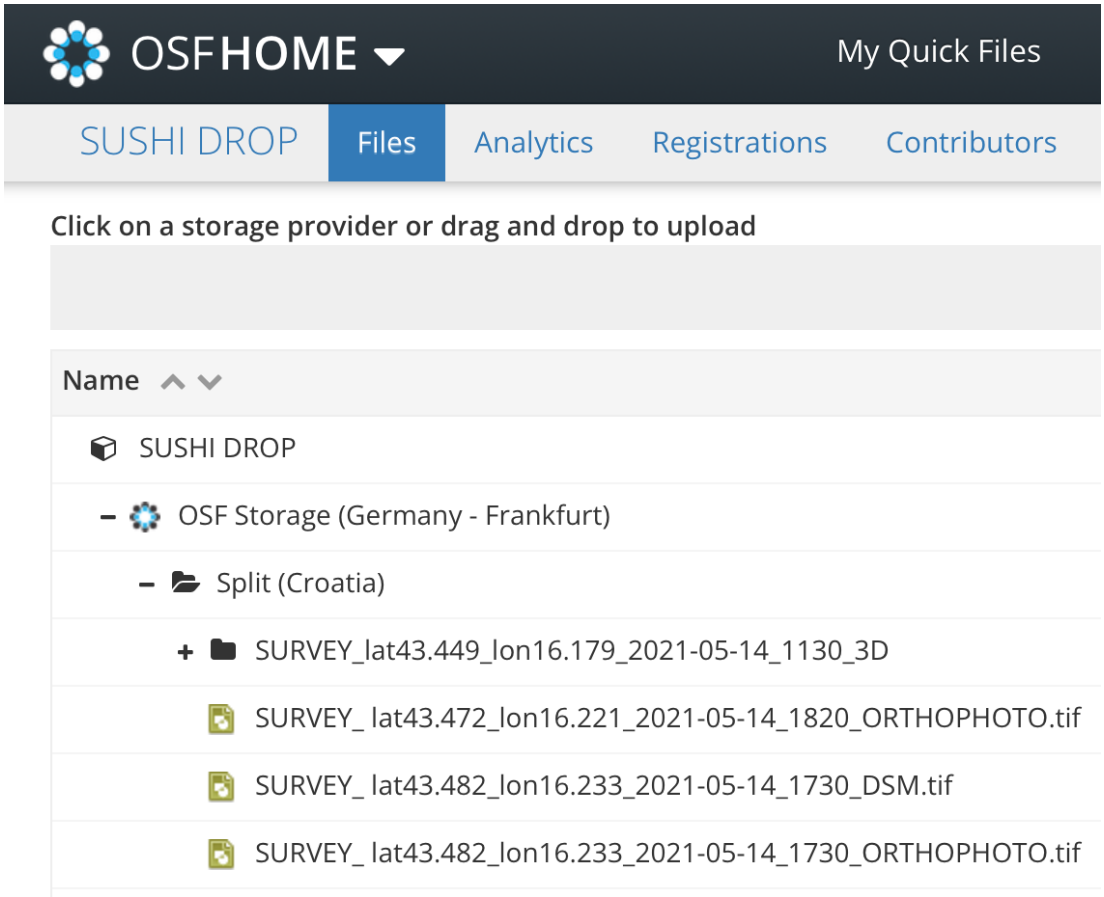

FIGURE 2 – EXAMPLES FROM OSF OPEN ACCESS DATABASE

The data resulting from the processing of what instrumental acquisition during the project surveys are exported in a format ready for consultation in Open Source GIS environment such as QGIS.

Among the available data we have orthophotomosaics (Figure 3) obtained by combining different subsequent underwater acquisitions with photogrammetric camera and then processed using innovative Structure From Motion (SFM) techinques: the shot position is estimated through the use of the same technique and finally scaled and confirmed by the previously processed positioning data (Figure 4).

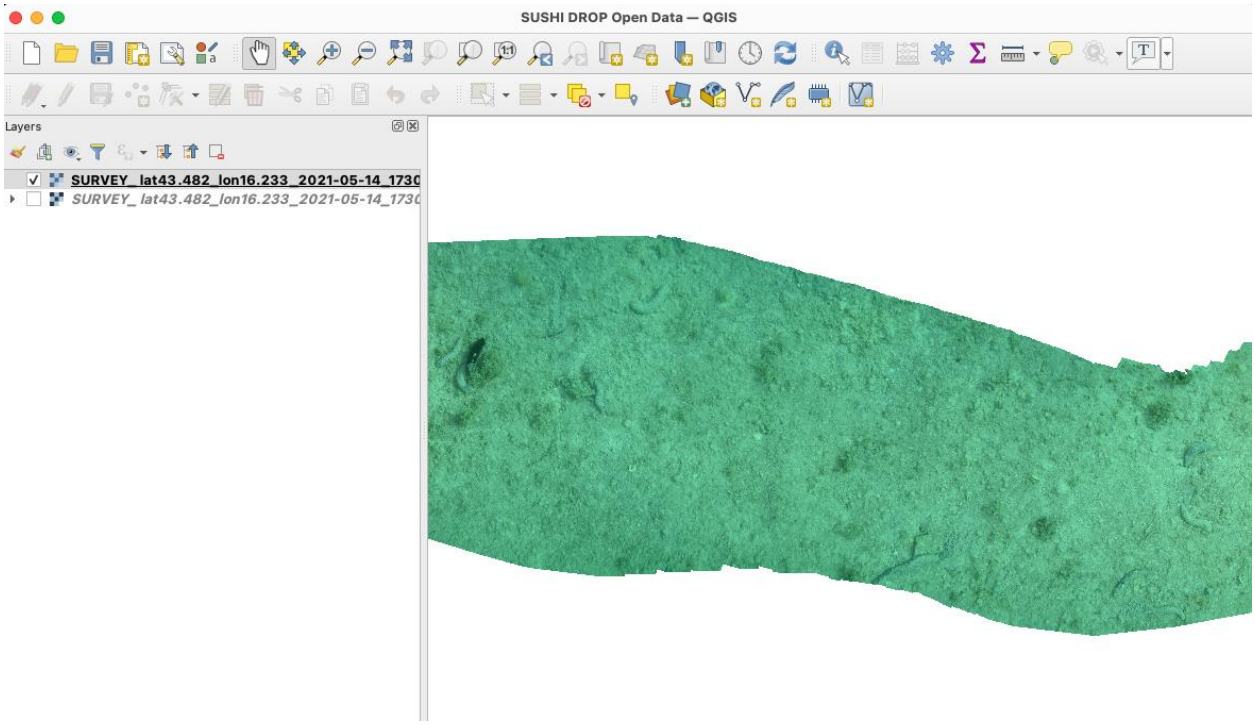

FIGURE 3 - EXAMPLE OF ORTHOPHOTO LAYER OUTPUT IN OPEN SOURCE GIS: QGIS

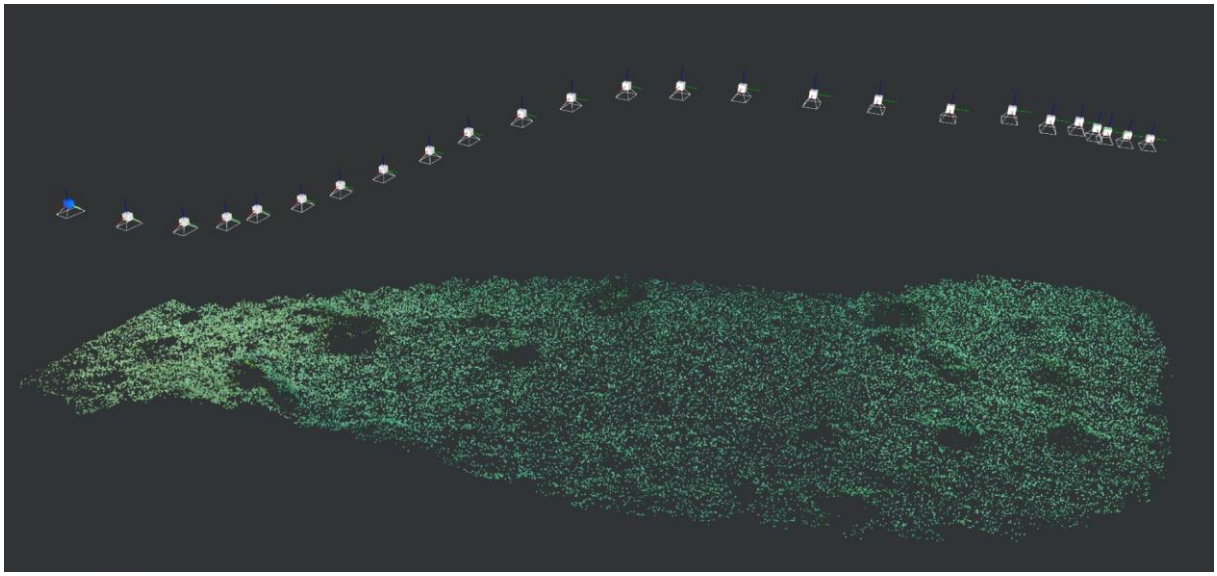

FIGURE 4 - SEQUENCE OF FRAMES ACQUIRED BY PHOTOGRAMMETRIC BOTTOMCAM

At the same time as the photogrammetric restitution, it is possible to create a map of the morphology of the seabed and of all the species linked to the seabed, producing an high-resolution Digital Surface Model (DSM). DSM are excellent products for the exhaustive description of the seabed, being structured as raster data and therefore as a continuous grid of the seabed composed of individual pixels at high resolution. The gridding and high resolution characteristics are made possible by the optimized characteristics of the camera sensor and its optical lens with a large Field Of View (FOV). This data is then available for consultation in a GIS environment in raster format (Figure 5).

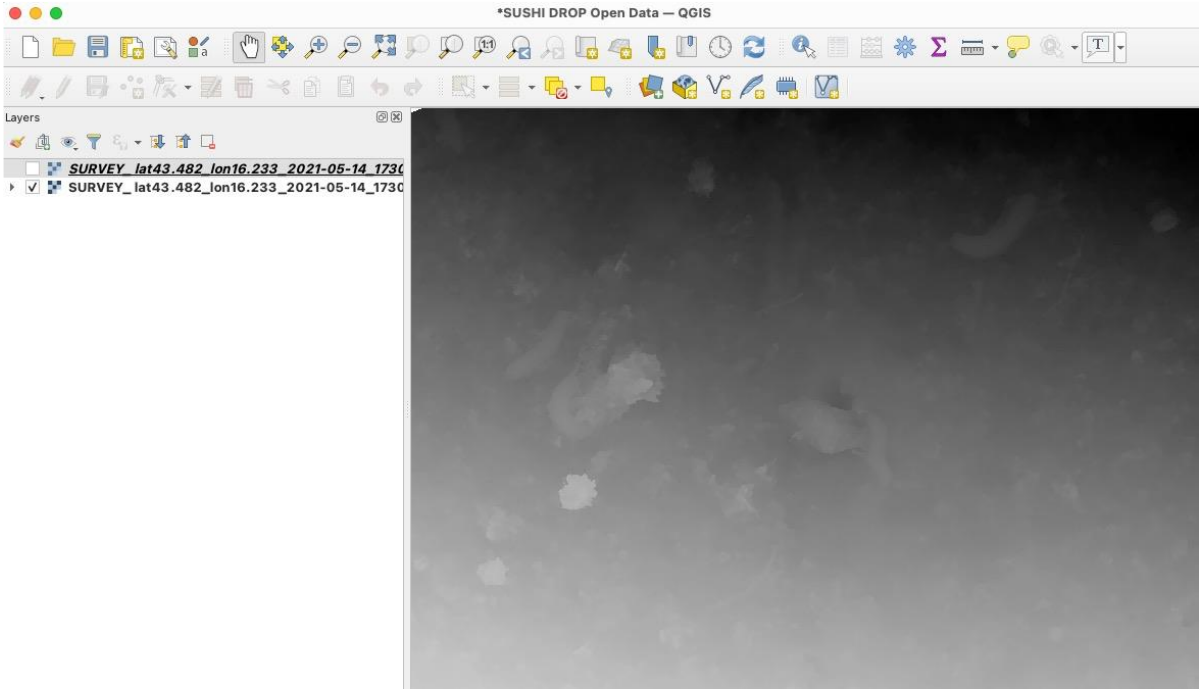

FIGURE 5 - EXAMPLE OF DSM LAYER OUTPUT IN OPEN SOURCE GIS: QGIS

In the submerged part of the survey, when the drone is close enough to the seabed and the complex elements such as cliffs, the images acquired with the high-resolution BottomCam create a three-dimensional point cloud, generated to obtain a complete model of the morphology. In these examples in Figure 6 the dense point cloud is colored with different shades, from blue highlighting points at greater depths, to red highlighting points of natural features located at shallower depths.

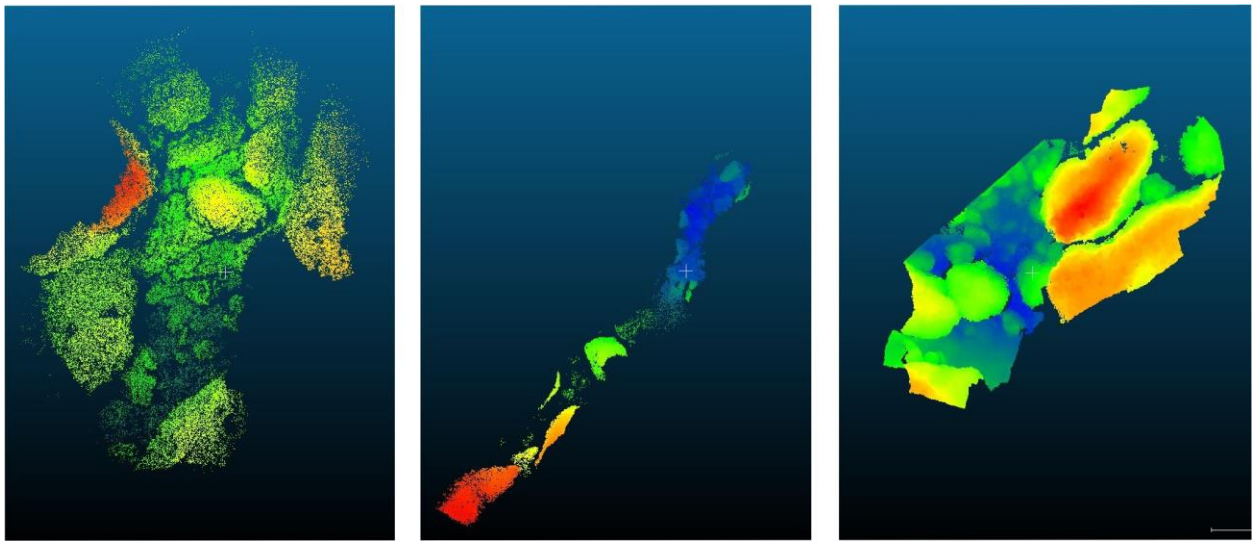

FIGURE 6 - THREE EXAMPLES OF POINT CLOUD DETAIL AT CLIFF AREAS

Abbreviations

The following abbreviations are used in this deliverable:

DEM	Digital Elevation Model
DSM	Digital Surface Model
FOV	Field Of View
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
INS	Inertial Navigation System
MBES	Multibeam Echosounder
NGC	Navigation Guidance Control
OSF	Open Science Framework
SFM	Structure from Motion
USBL	Ultra-Short Baseline
UUV	Unmanned Underwater Vehicle

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