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1. Executive Summary

The number of physical, biogeochemical and bio-optical sensors in marine research and monitoring has increased during the last decade. These sensors collect large amounts of data and the importance of metadata and quality control is invaluable for scientists and others who use the data. Platforms for sensors include ships (e.g. research vessels and ships of opportunity, e.g ferrybox systems) and fixed platforms, e.g. instrumented oceanographic buoys. Data are used e.g. for monitoring purposes, research, model development and data assimilation.

The GISMO Toolbox software was developed by the oceanographic unit of the Swedish Meteorological and Hydrological Institute (SMHI) after consultation with other JERICO-NEXT partners. The aim of the software is to provide user friendly tools for off line quality control of physical, bio-optical and biochemical oceanographic parameters collected using automated systems such as ferryboxes and fixed platforms, e.g instrumented oceanographic buoys. The software was designed to handle large datasets from the automated instruments and to compare and combine the high frequency data with data collected using manual methods, i.e. high quality reference measurements on water samples. Functions for adding quality flags of the individual parameters are included. The software also includes functions for visualising data on graphs and maps. GISMO Toolbox is available open source at GIThub. The software was developed using Python 3. Included with the release are a user guide and example data sets from Sweden. Both examples files emanates from the Baltic Sea.

2. Introduction

As ocean monitoring with high resolution sensors on ferryboxes and fixed platforms has increased during the last decades, there is a demand for quality control tools. The sensors, for physical, bio-optical and biogeochemical parameters, collect large amounts of data and the importance of metadata and quality control is invaluable when scientists want to use the data from different platforms for research, development or modelling. Without quality control there is no long term value of data.
A lot of work has been done within JERICO-NEXT and other European projects in order to harmonize metadata, quality control and data management of both near real time data and delayed mode data.

SMHI have within the JERICO-NEXT project, deliverable 5.12 “Software for QC of biochemical data from ferrybox and fixed platforms", developed an open source based application to enhance and simplify quality control of biochemical data in delayed mode. One main feature is the ability to compare water sample data with sensor data, but also standard functionalities as plotting, filtering and flagging data is included. If there are several different platforms in the same area it is valuable for quality control and they could easily be compared in the software.

3. Objective of the report

This work is done in the JERICO-NEXT WP5 and the report consists of an introduction to the quality control software GISMO Toolbox.

4. GISMO Toolbox

The GISMO Toolbox is an application to manually perform quality control of in situ ocean data from different sampling types such as ferryboxes and fixed platforms. As of now it is setup to use the standard CMEMS data format. Functionalities include visual flagging of data, comparison between different data sources and interactive plot exports.
The GISMO toolbox software (available at https://github.com/sharksmhi/gismo_gui_tkinter) is distributed free of charge under the MIT license (https://opensource.org/licenses/MIT).

The application was developed using Pythion 3 and have been tested on Windows. For requirements and guidance on how to install please see the file README.md in the application root directory.

You have a series of sub set menus above the map windows where you can set the time range and select data to flag in different ways. You can either select a period of time that you want to flag in a certain way or use mark in the plot itself. The flags have the default set up from the QARTOD guidelines, (https://ioos.noaa.gov/project/qartod/), also used by CMEMS.

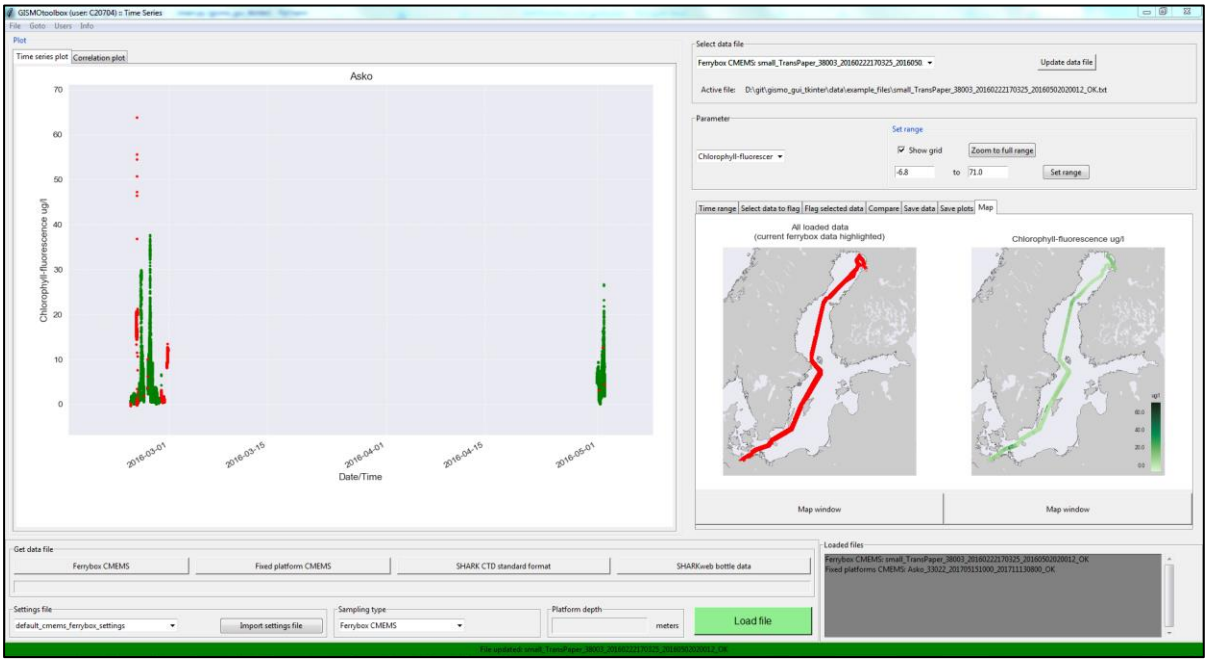

Figure 1. GISMO Toolbox layout.

It is possible to upload data from an additional sensor type for comparison and correlation. For the SMHI set up, there is SHARKweb bottle data that navigates to a SHARKweb-file. The application is setup to handle SMHI SHARKweb data which can be downloaded here:

https://www.smhi.se/klimatdata/oceanografi/havsmiljodata/marina-miljoovervakningsdata as sampling data. (Tab-separated column data with English header. To use other kinds of data, see chapter 8 Advanced Options in the GISMOtoolbox_user_manual in the appendix.)
For the correlation, it is possible to set limits in time, distance and depth for the comparison file to be valid. Two types of correlation plots can be generated, plots with colors according to flag or colors according to depths.

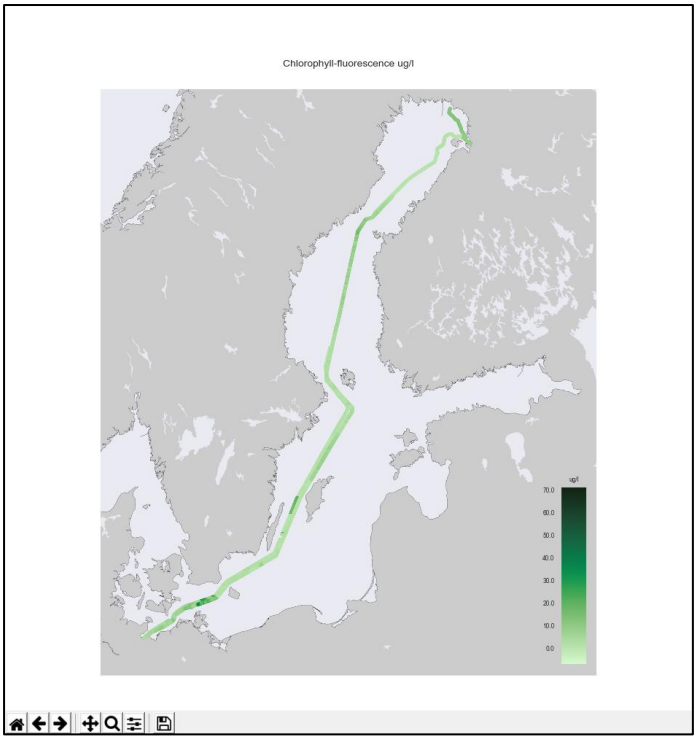

Figure 2. Chlorophyll fluorescence measured with the ferrybox on M/S Tavastland.

5. Feedback from users

We would greatly appreciate any comments, suggestions or feedback, please contact shark@smhi.se.

6. Future developments

In order to further improve the GISMO Toolbox, the use of data from CTD and profiling systems will be added.

7. Annex

GISMO Toolbox and the GISMO Toolbox user manual is available at:
https://github.com/sharksmhi/gismo_gui_tkinter
https://github.com/sharksmhi/gismo_gui_tkinter/blob/master/docs/GISMOtoolbox_user_guide.docx