Development of a standalone solar tracking hyperspectral sensor platform

Dieter Vansteenwegen (VLIZ), Kevin Ruddick (RBINS), André Cattrijsse (VLIZ), Thanos Gkritzalis (VLIZ), Dimitry Van der Zande (RBINS)

Contact: dieter.vansteenwegen@vliz.be

Hypermaq research project

The Hypermaq research project aims to develop new processing algorithms for hyperspectral images, with a focus on satellite imagery.

The aim is to develop methods to determine spatial and temporal information not just on suspended particle and chlorophyll a concentration but also on particle size and composition of suspended particulate matter in coastal waters, as well as phytoplankton and benthic community composition.

The present poster describes the instrument development work to design a pointing and control system for hyperspectral radiometers as needed for the validation of satellite data.

Why satellite validation? How?

Design of new algorithms for the processing of hyperspectral satellite images requires reliable ground truth data.

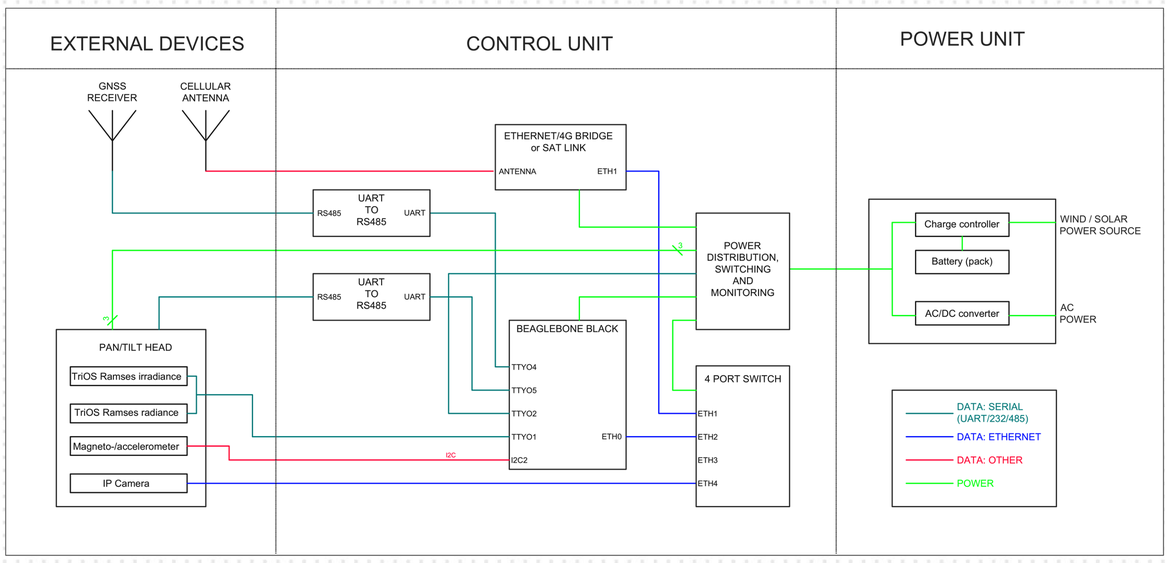
To acquire these measurements we are creating a self-reliant, modular sensor platform that can autonomously collect and process hyperspectral spectroradiometer measurements while tracking the movement of the sun. Users can change measurement parameters remotely, obviating difficult or expensive on-site visits.

Modular system design

Using a modular approach facilitates adaptation to the requirements of diverse setups:

- Power system: standalone use with solar panels/windmill and batteries, or AC power system if available.
- Software: runs on a Linux operating system and communicates with each piece of hardware using dedicated Python software libraries. These can easily be adapted to suit other brands/types of hardware offering the same functionality.
- Hardware: different mounting options are proposed, but creating enclosures and brackets tailored to specific needs is also possible.

Working principles



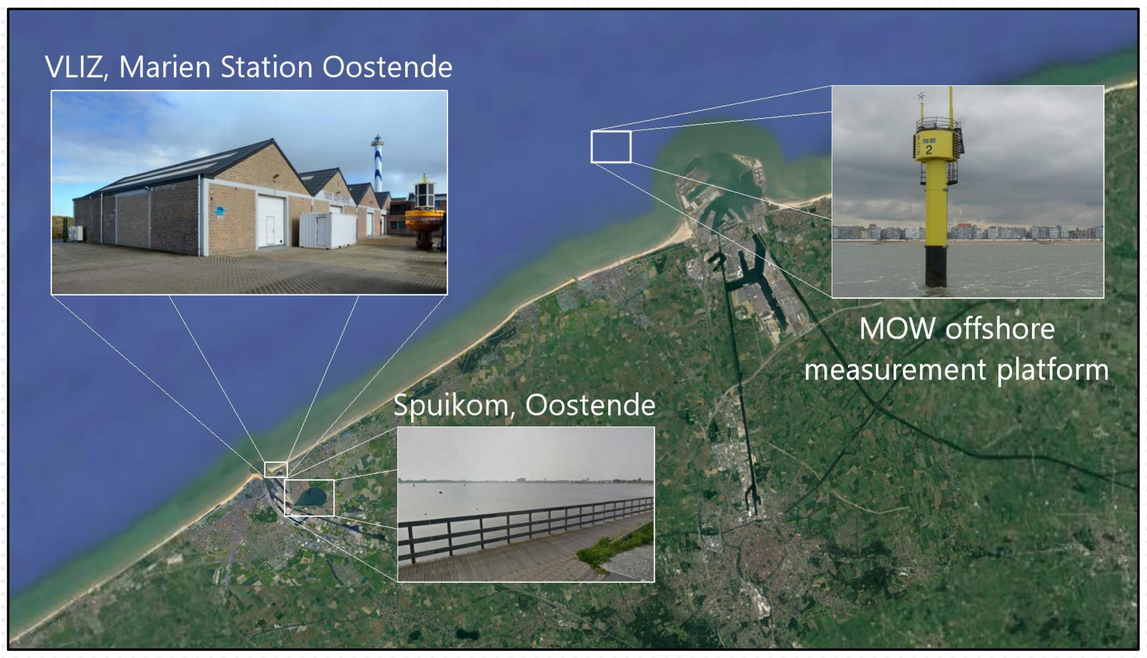
- Controlled by a low-power embedded Linux platform.
- A GPS receiver provides time and location to calculate solar angles.
- The system then rotates the sensors, mounted on a pan/tilt head.
- Measurements are then performed, and the resulting data are logged in a database.

Requirements

- Low power usage
- Designed for marine environments
- Pointing calibration must be possible in bad weather conditions
- Autonomous with little or no user intervention
- Communication by 3G/GSM or satellite link
- Automatic upload of data to server

Tasks and schedule

- Design electronics, hardware and software (end 2017)
- Production of a working prototype (end 2017)
- In-house outdoor tests (Q4 2017)
- Sea trials (Q1-Q2 2018)
- Worldwide deployment at sites of interest (start 2019)



Belgian test locations

Images: VLIZ, Google maps

Vlaams Instituut voor de Zee vzw
Flanders Marine Institute

Flanders Marine Institute (VLIZ)
Wandelaarkaai 7, 8400 Oostende, Belgium

Royal Belgian Institute of Natural Sciences (RBINS)
100 Gulledelle, 1200 Brussels, Belgium

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