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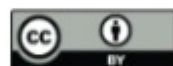
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# Using an open source approach to remotely collect reliable environmental data

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Environmental monitoring programs carried out by expeditions or autonomous stations are expensive and only allow measurements for discrete times and locations. After data acquisition most of the data needs hand-operated validation and evaluation before being stored in databases.

For a higher local and temporal resolution on parameters of marine ecosystems, it is planned to extend monitoring programs by attaching a small-sized module, which combines a microcontroller with multiple sensors, to ships of opportunity or any other suitable platform. The module design focuses on the usability, reliability and interoperability of the derived data by using metadata information and assessing in-situ which data is relevant to be measured and stored.

Using an ESP32, a popular microcontroller, to collect data from OEM sensors of different manufacturers enables a high flexibility in parameters and sensor types. The use of different OEM sensors also allows to experiment with unconventional hydrological sensors. The proposed open source module attempts to collect data as reliable as with conventional monitoring sensor systems.

This approach allows an event based data acquisition, e.g. by adjusting the sampling rate so that only as much data as necessary is measured. In order to provide precise spatio-temporal referencing, the system contains a real time clock and GPS positioning. Moreover, storing the raw data of the sensors alongside their calibration coefficients enables post-processing of the data. The ESP32 transmits the stored data to a server via WiFi or an external LTE module. From this point on, a machine-based validation, flagging of relevant data and basic visualization can assist the evaluation.

With such a module integrating multiple sensors and focusing on the interpretation and use of data starting at the measurement, reliable and pre-evaluated data from hard to access areas can be obtained and contribute to the assessment of dynamic and heterogeneous ecosystems.

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