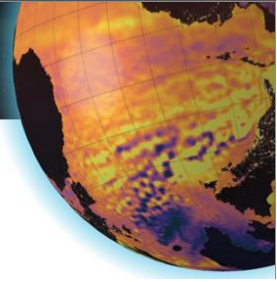


Chlorosat: detection of HABs for chilean aquaculture by hybridation of Sentinel 2 and in situ sampling data

Phytoplankton is vital for marine ecosystems but can turn into Harmful Algal Blooms (HABs), posing risks to marine life and humans. Seasonal factors like temperature and nutrients fuel these blooms, increasingly influenced by human activities and climate change. In Southern Chile, HABs threaten salmon farming, impacting fish health and triggering various mitigation strategies. Satellite imagery and in-situ measurements can be of great help for these mitigation processes, through the development of monitoring and forecasting solutions. A comprehensive approach blending monitoring, prediction, and adaptive strategies is crucial to protect the aquaculture industry from HABs. BiOceanOr joined forces with Hytech-Imaging to expand its water quality services and include satellite processing into a HAB early warning system. The aim of the consortium is to detect and characterize blooms using in-situ measurements and satellite data, working closely with salmon farmers to tailor products to the existing mitigation strategies. The project's focus is to build an early warning system for bloom detection and risk assessment, leveraging multisource data analysis in a complex coastal environment. BiOceanOr collaborated with the top Chilean salmon farmer Mowi, gaining access to extensive in-situ phytoplankton abundance data across 44 sites since 2016, offering detailed insights into phytoplankton populations in Southern Chile. This dataset aids in detecting, characterizing, and forecasting algal blooms. An automated pipeline was developed from raw data to identify monospecies bloom events and determine their initiation, peak value and duration. This pipeline will be used for statistical modelling and calibration of satellite processing. Two main solutions were developed using Sentinel-2 data: the foundations of a large-scale bloom detection demonstrator which will be further tested in Chlorosat 2, and an adaptation of Hytech-Imaging's SWIM-SAT suite to estimate chlorophyll near landlocked concessions of Chilean fjords. Challenges arose, in particular regarding the correction of adjacency effects. Despite this, the project successfully identified known and new blooms using satellite imagery, in particular a bloom of *Alexandrium catenella*, justifying the need to refine bloom monitoring tools. Strategies to address these challenges have been defined and will be implemented in the upcoming projects aiming to study harmful algal blooms in Chile and South Australia, leveraging new data sources and multisensor approaches.



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