HABs, ocean color remote sensing, bio-optical monitoring in fjords and aquaculture activities.

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The main objective is to study several HAB events in optically-complex waters of Chile´s Patagonian fjords, and apply ocean color remote sensing and bio-optical methods.

It is well observed by human vision that many large biomass HABs produce important water color modifications, among others attributes. However, HAB monitoring and assessing spectral optical properties variability, such as; reflectance, backscattering, surface *in situ* chlorophyll **a** fluorescent, near real-time cells imaging, etc., are not easy tasks, particularly in optically-complex and cloudy coastal waters, such as the Patagonian fjords. The main constituents in the photic water column, are CDOM, re-suspended material, different species and sizes of phytoplankton cells and occasionally glacial silt, and ash plumes. The photo-autotrophic flagellate's cells are subject to much dynamic movement, creating very heterogeneous distributions in stratified water columns, and in many cases generating sub-surface cellular thin layers, which indeed, are the most optically significant layers, as determined using WISP-3 reflectance, absorption, backscattering, cells abundance and Fv.

Under this biologically complex scenario with enormous economic, social and media pressure facing the aquaculture industry, governmental authorities and resource managers need to keep the industry and the public informed HABs in near-real-time. Therefore, fast data processing schemes and near real-time e-cloud data visualization are very necessary.

Hence, the scientific application provides an opportunity to precisely measure and develop algorithms for identification of **"bio-optical cellular fingerprint"** using *in situ* near–real time optical properties and remote sensing color sensors. In optically complex waters, improved bio-optical algorithms are required for the identification of phytoplankton functional groups and species discrimination, with additional use of complementary techniques, like microscopy, cytometric imaging and molecular biology.

Some key extreme HAB events will be presented, obtained from a 30-year phytoplankton monitoring program, that assists the aquaculture sector. During this time period, at least 3 extremes cases were observed; spring of 1988, late summer of 1998 and 2016, respectively.

Finally, scientists need to continue modeling and forecasting HAB distributions, but with more focus on optical species-specific signal rather than only chlorophyll *a* based method. In this way aquaculture users can better mitigate the risk, with an on-line information system similar to the meteorological forecast service.