Advanced Laser Fluorometry (ALF): New Technology for Oceanography and Environmental Monitoring

Alexander Chekalyuk

DOI: 10.1016/j.dsr2.2013.12.004

ABSTRACT The Advanced Laser Fluorometry (ALF) has been recently developed for characterization of natural aquatic environments. It provides assessments of phytoplankton pigments, biomass, photophysiology, community composition, and chromophoric organic matter (COM). The environmental applications include oil/PAH detection and spectral discrimination from COM fluorescence. The ALF has been tested in the Pacific, Atlantic, and Arctic Oceans; Mediterranean, Arabian, and Bering Seas; Gulf of Mexico; Chesapeake, Delaware, and Monterey Bays; and Amazon and Congo River plumes. Its modular design allows flexible instrument configuration to optimize measurements in various water types. Several instrument modifications can be used for flow-through, fiber-probe, and in situ measurements. The commercial ALF instrument, the WET Labs Aquatic Laser Fluorescence Analyzer (ALFA) can be used for fully automated long-term underway measurements from various platforms. The recently developed ALF In Situ (ALFIS) prototype incorporates fiber-probe sampling. The probe will facilitate ALF technology in surface and submersible AUVs and gliders, vertical profilers, towed and stationary platforms (buoys, moorings, platforms, bridges, etc.). The fiber-probe sensor will allow sampling from remote locations and various depths. It is feasible to implement the ALF analytical capabilities in compact airborne LIDAR-fluorosensors. An example of ALF measurements across the A-front in the Southern California Current Ecosystem. Three distinct autotrophic assemblages were identified. Northern waters were dominated by a blue-water type of Synechococcus cyanobacteria accompanied by green-water Synechococcus and cryptophytes. The highest phytoplankton biomass, dominated by diatoms and accompanied by elevated F v /F m were found directly at the front. Strong structural frontal responses were also revealed by high-frequency underway ALF surface sampling ([5]).