Abstract:

Within this study the potential of using radiometric measurements obtained by a hyperspectral sensor mounted to an undulating platform towed behind the ship to retrieve phytoplankton composition data was investigated. Different phytoplankton groups dominate ocean biomes and by that drive differently the marine food web and biogeochemical cycling. However, their distribution over the ocean remains uncertain due to low sampling resolution by in-situ and satellite data. This is especially limited considering their distribution below surface water. The study by Bracher et al. (2020) enabled robust biomass predictions of seven phytoplankton groups for several transects of 50 to 150km length in the tropical and subtropical Atlantic Ocean with high horizontal (~1km) and vertical (~10m) resolution to the euphotic depth and deeper (as an example results from a transect along the Longhurst (2007) provinces North Atlantic Tropical Gyre and Canary Current Coast are shown in the Figure below). These phytoplankton groups represent more than 90% of the total phytoplankton biomass in this Ocean. The phytoplankton group data was derived by fitting empirical orthogonal functions to hyperspectral optical properties obtained from the depth resolved radiometric measurements. Then multiple linear regression models with pigment based phytoplankton group biomass as the response variable and scores from selected empirical orthogonal function modes as predictor variables were developed. This provides the prospect to put similar radiometers on profiling floats or gliders to enable large scale collection of high horizontal and vertical resolved phytoplankton data.