Wednesday, October 10
Oral Session 6
08:30–09:50

09:30–09:50

HIGH-RESOLUTION SATELLITE REMOTE SENSING OF COASTAL RED TIDES USING LABORATORY MEASUREMENTS OF MESODINIUM RUBRUM OPTICAL PROPERTIES

Mesodinium rubrum is a globally-distributed photosynthetic marine ciliate known to form ephemeral and massive red tides in coastal areas, such as estuaries, fjords, and upwelling zones. Though M. rubrum does not produce toxins, it has been identified as prey for Dinophysis spp., a dinoflagellate responsible for the diarrheic shellfish poisoning toxin. M. rubrum blooms are generally classified as Harmful Algal Blooms (HABs) due to their impact on water quality (i.e., oxygen depletion, modification of food-web dynamics). Detection, sampling, and quantification of such HABs is notoriously challenging due to the speed at which this ciliate can grow, swim, aggregate, disaggregate, and/or be consumed. Here, we present a novel detection and quantification method based on ocean colour satellite remote sensing. The inherent optical properties (absorption and backscattering coefficients) of M. rubrum were first characterized using laboratory measurements. Second, a simplified radiative transfer model was used to simulate the specific signature of M. rubrum, in terms of remote sensing reflectance (Rrs). Third, a detection and quantification algorithm was developed based on the specific shape of the simulated Rrs spectra: a 705 nm peak associated with high Chlorophyll-a biomass and a green trough associated with Phycoerythrin absorption. Fourth, the algorithm was applied to the 2016-2018 archive of Sentinel-2 satellite data. Several red tides were successfully detected, allowing us to study the spatio-temporal dynamics of M. rubrum blooms at high resolution (20 m, 5 days revisit) over a wide coastal area. Massive blooms of other species (e.g., Lepidodinium chlorophorum) were also observed and successfully discriminated.

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