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Development and application of an algorithm for detecting undesirable *Phaeocystis globosa* blooms from space

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Detecting blooms of harmful phytoplankton species from space is a challenge for assessing their timing, spatial extent and magnitude. This is particularly relevant in the eutrophied Southern Bight of the North Sea, where high spring concentrations of chlorophyll a correspond to blooms of the colonial haptophyte *Phaeocystis globosa* co-occurring with diatoms. As a preliminary step towards the formulation of an algorithm for detecting specifically *Phaeocystis* from space, we investigated under laboratory conditions the specific optical properties of pure cultures. Results show a significant difference between the absorption spectra of diatoms and *Phaeocystis*, in particular at 467 nm due the light absorption of chlorophyll $c3$ (Chl $c3$) in the haptophyte. This optical characteristic, which can be used to discriminate these two phytoplankton groups, is retrieved in natural communities. On this basis, a *Phaeocystis* detection algorithm has been developed to detect the presence of Chl $c3$using either total absorption or water-leaving reflectance field data. Application of this algorithm to *Phaeocystis*-dominated natural communities shows that it works with both total absorption and reflectance data. The validation shows that the algorithm can flag the presence of *Phaeocystis* and provide quantitative information above a Chl $c3$threshold of 0.8 mg m^{-3} corresponding to a *Phaeocystis* cell density of 7 10^6 cells L^{-1}. The possibility of extrapolating this information to remote sensing reflectance data in these turbid waters where other components of the water (coloured dissolved organic matter, suspended matter) are contributing largely to the total absorption, especially in the

blue part of the spectrum is evaluated.