# Phytoplankton bloom phenology along the Norwegian continental shelf

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## 1. Objective

Use satellite chlorophyll-a (Chl-a) from 2000 to 2020 to assess the climatological trend and the interannual variability of spring and summer blooms onset, peak day, duration and intensity. We also correlate the interannual variability of the blooms with mixed layer depth (MLD), sea surface temperature (SST), wind speed and suspended particulate matter (SPM) during the climatology bloom periods to identify potential drivers.

## 2. Dataset

| Source | Variables | Spatial resolution | Temporal resolution | Time range |
|---|---|---|---|---|
| OC-CCI | Chl-a (mg $m^{-3}$) | 4 km | 8 days | 2000 - 2020 |
| CCI/C3S | SST (K) | 0.05° | Daily | 2000 - 2020 |
| GlobColour | SPM (g $m^{-3}$) | 4 km | 8 days | 2000 - 2020 |
| TOPAZ | MLD (m) | 12.5 km | Daily | 2000 - 2020 |
| IFREMER CERSAT | Wind Speed (m $s^{-1}$) | 0.25° | 6 hours | 2000 - 2019 |

Table 1. Dataset used in the study.

## 3. Sub-regions

K-means is used for clustering the 21 years of Chl-a concentration into 16 sub-regions, where each sub-region exhibits different seasonal time series from each other.

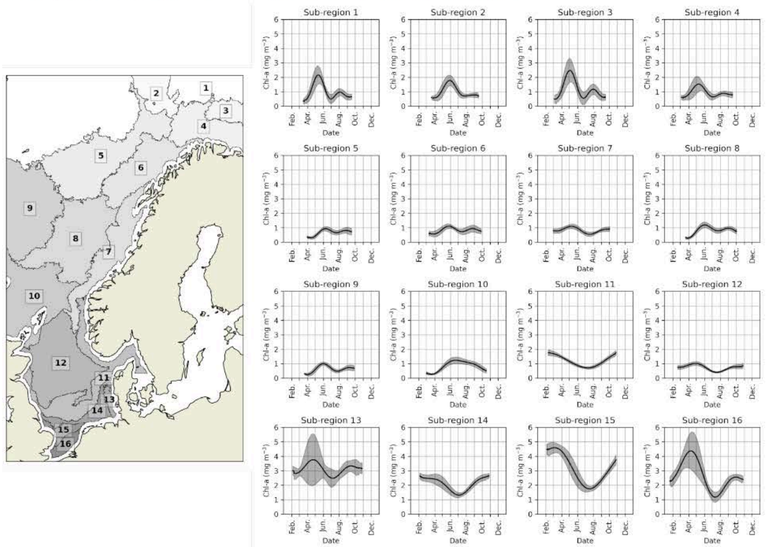


Figure 1. Clustered sub-regions using the Chl-a time series. Solid line is the average and shaded area is the ± 1 standard deviation.

## Acknowledgments

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## 4. Blooms climatology

The climatology of the blooms phenology is estimated for each sub-region.

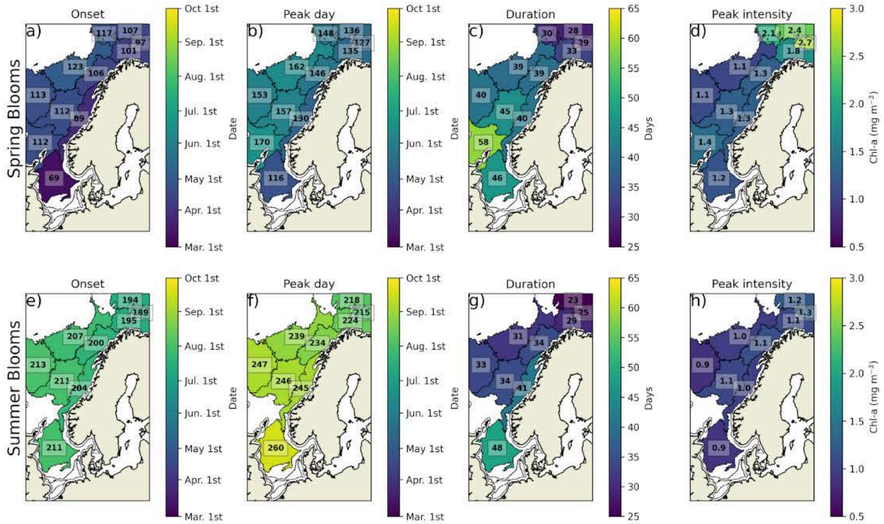


Figure 2. The climatology of the spring and summer blooms phenology. Values in the white box in the onset and peak day (a, b, e and f) are in day of the year.

## 5. Blooms phenology trends

The most notable changes are found in the summer blooms from the North Sea to the Barents Sea, which are starting and ending later and becoming longer and stronger.

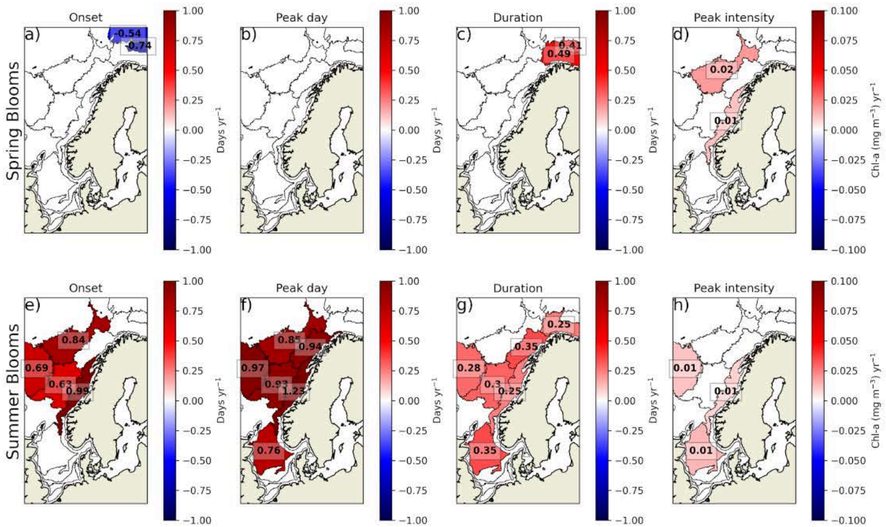


Figure 3. The trends slope of each phenology of spring and summer blooms.

## 6. Interannual detrended correlation

During the spring, years of shallower MLD are correlated with earlier and stronger blooms in most sub-regions. In the Norwegian Sea, warmer waters are correlated with earlier and stronger blooms in the western and southern regions; however, colder waters are correlated with later and stronger blooms in the eastern part. Higher wind speed is correlated with later and weaker blooms in the Barents Sea due to its influence on MLD. Lower SPM concentrations are correlated with more intense blooms in the North Sea. Regarding the summer blooms, no significant results are found.

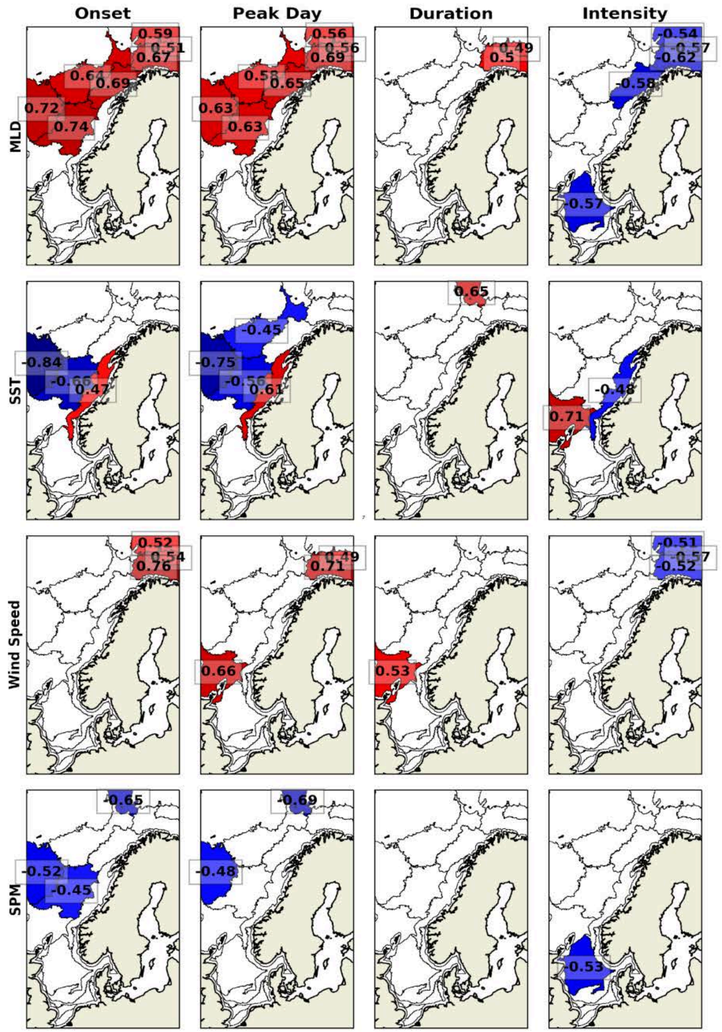


Figure 4. Interannual detrended correlation between the spring phytoplankton blooms phenology and physical/biogeochemical parameters. Red colors denote positive correlations and blue colors denote negative correlations.