

# Drivers of the variability of dimethylsulfoniopropionate (DMSP) and dimethylsulfoxide (DMSO) in the Southern North Sea

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## TAKE HOME MESSAGE

- ❑ Comparison of (a)biotic drivers and DMS(P,O) concentrations between 2016 and 2018
- ❑ **Chl a** concentration higher during the early spring and summer diatom blooms in 2018 due to higher incident light + colder winter + higher nutrient inputs
- ❑ Seasonal variation of **DMS(P,O)<sub>p</sub>:Chl a** ratio identical

## Context

- DMS(P,O)** Are the precursors of DMS – climate active gas impacting the Earth's radiative balance  
Are playing several hypothetical roles on phytoplankton cells: cryoprotectant, osmoregulator or antioxidant
- BCZ** Belgian Coastal Zone - Coastal waters characterized by three phytoplanktonic blooms:  
 1) The first in early spring dominated by diatoms  
 2) The second in late spring dominated by the Prymnesiophyceae *Phaeocystis globosa*  
 3) The third in summer dominated by diatoms

## Goal

Are the environmental drivers influencing the interannual variability between 2016 and 2018 of  
**phytoplankton chlorophyll a concentration?**  
**phytoplankton community composition?**  
**DMSP and DMSO concentration?**

## Material

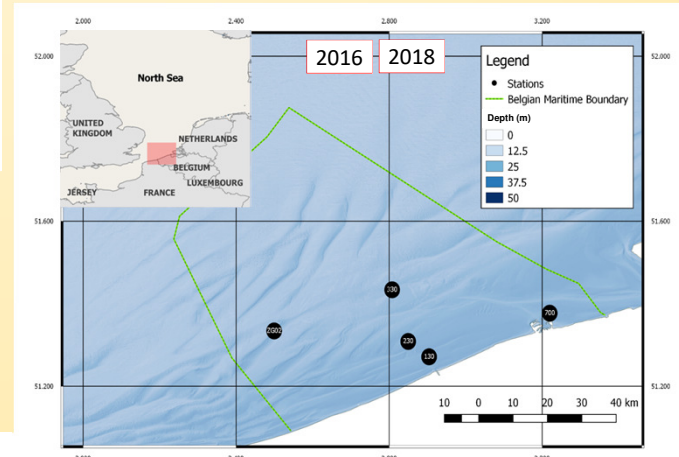
- Sampling** each month during the year 2016 and 2018  
 bimonthly between March and May  
 five fixed stations covering near- and off-shore gradient
- Abiotic parameters** Sea Surface Temperature (SST)  
 Sea Surface Salinity  
 Photosynthetic Active Radiation (PAR)  
 Nutrient concentrations

Biotic parameters

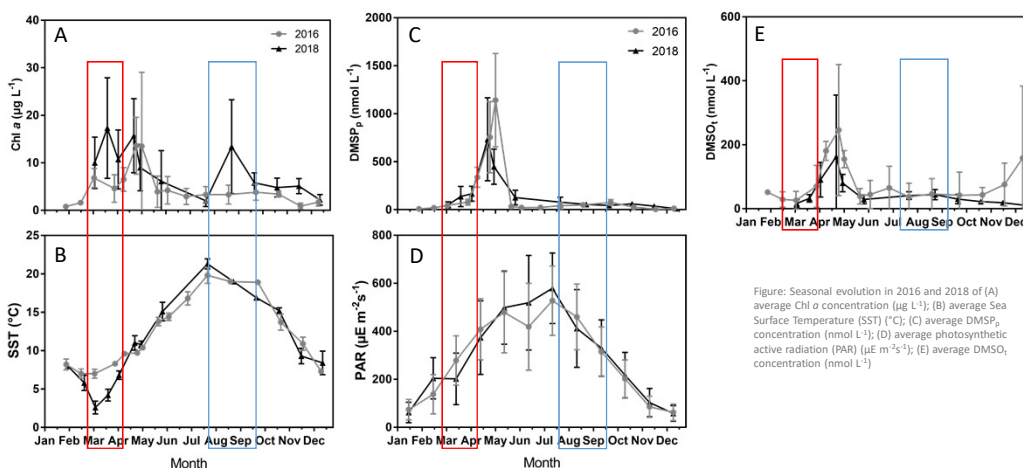
Chlorophyll a (Chl a) concentrations  
 Phytoplankton diversity  
 DMSP and DMSO concentration

## Method

Fluorometry for Chl a  
 DNA sequencing for phytoplankton diversity  
 Gas Chromatography for DMS(P,O)



## Results



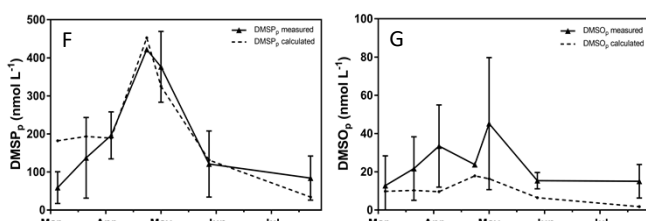
Chl a different in early spring (Fig. A)

- ✓ SST in winter 2018 < 2016 (Fig. B)
  - Less zooplankton grazing
- ✓ PAR in February 2018 > 2016 (Fig. D)
  - Early onset of the bloom
- ✓ DMS(P,O) similar (Fig. C, E)
  - Low-DMSP producers dominated the phytoplankton community

Chl a different in summer (Fig. A)

- ✓ SST in July 2018 > 2016 (Fig. B)
  - Promoting growth
- ✓ PAR in June-July 2018 > 2016 (Fig. D)
  - Explaining the higher SST
- ✓ DMS(P,O) similar (Fig. C, E)
  - Low-DMSP producers dominated the phytoplankton community

Figure: Seasonal evolution in 2016 and 2018 of (A) average Chl a concentration ( $\mu\text{g L}^{-1}$ ); (B) average Sea Surface Temperature (SST) ( $^{\circ}\text{C}$ ); (C) average DMSP<sub>p</sub> concentration ( $\text{nmol L}^{-1}$ ); (D) average photosynthetic active radiation (PAR) ( $\mu\text{E m}^{-2}\text{s}^{-1}$ ); (E) average DMSO concentration ( $\text{nmol L}^{-1}$ )



Empirical relation for DMS(P,O)<sub>p</sub> estimation:

$$\text{DMS(P,O)}_p : \text{Chl a}^1 * \text{Relative abundance}^2 * \text{Chl a concentration}^3 = \text{DMS(P,O)}_p \text{ calculated}$$

<sup>1</sup>From literature review; <sup>2</sup>From DNA sequencing; <sup>3</sup>From Chl a analysis

DMS(P,O) estimation based on phytoplankton diversity:

- ✓ Good estimation of DMSP (Fig. F)
- ✓ DMSO estimation did not reproduce the concentration neither the seasonality of DMSO measurements (Fig. G)
- ✓ Need to generate specific DMSO:Chl a ratio for each phytoplankton group linked to environmental stress

Figure: (F-G) DMS(P,O)<sub>p</sub> measured ( $\text{nmol L}^{-1}$ ) and DMS(P,O)<sub>p</sub> calculated ( $\text{nmol L}^{-1}$ ) based on the empirical relations of Fig. H.