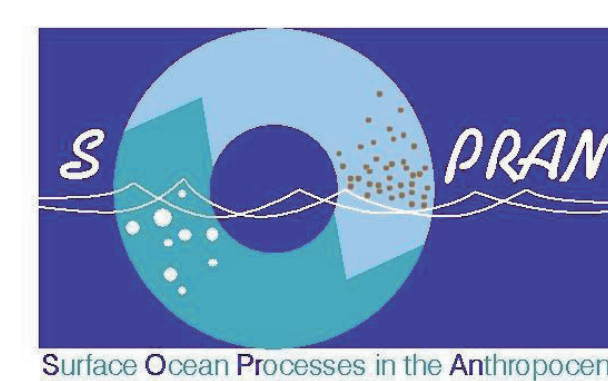


# Organic carbon and aliphatic amines in marine particles: exchange processes between ocean and atmosphere

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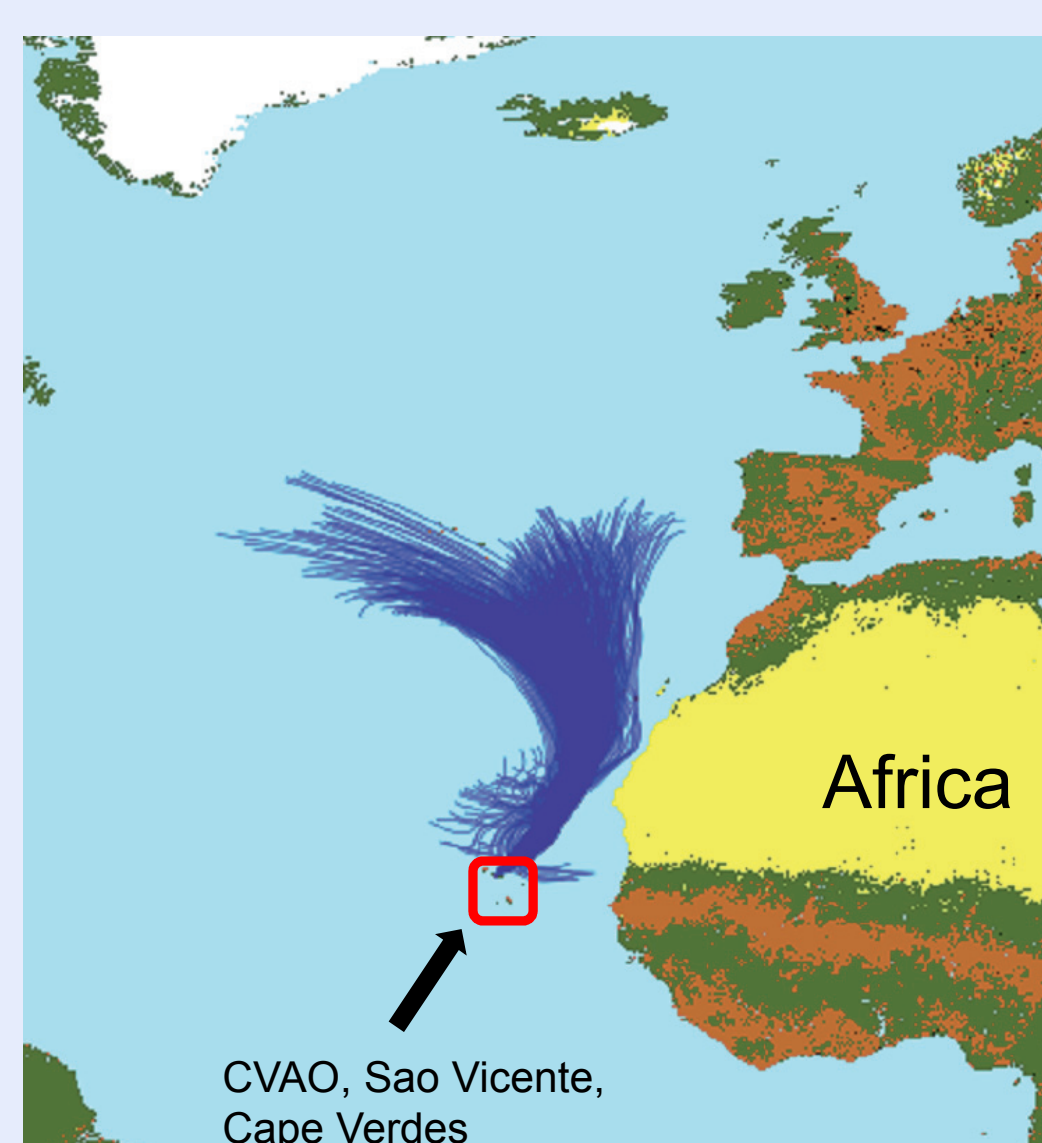


## Introduction

- Within exchange processes between air and sea, the export of organic compounds from the oceans to the atmosphere play an essential role as the oceans cover a substantial area of the planet.
- In order to investigate such interactions, in two intensive campaigns in 2011 at the Cape Verde islands, seawater and marine aerosol was sampled and analyzed regarding the organic content.
- The Cape Verdes islands generally represent a region of low nutrient supply and biological activity, but at certain times of the year biological activity increases due to local upwelling and nutrient input from the desert via dust deposition [1].

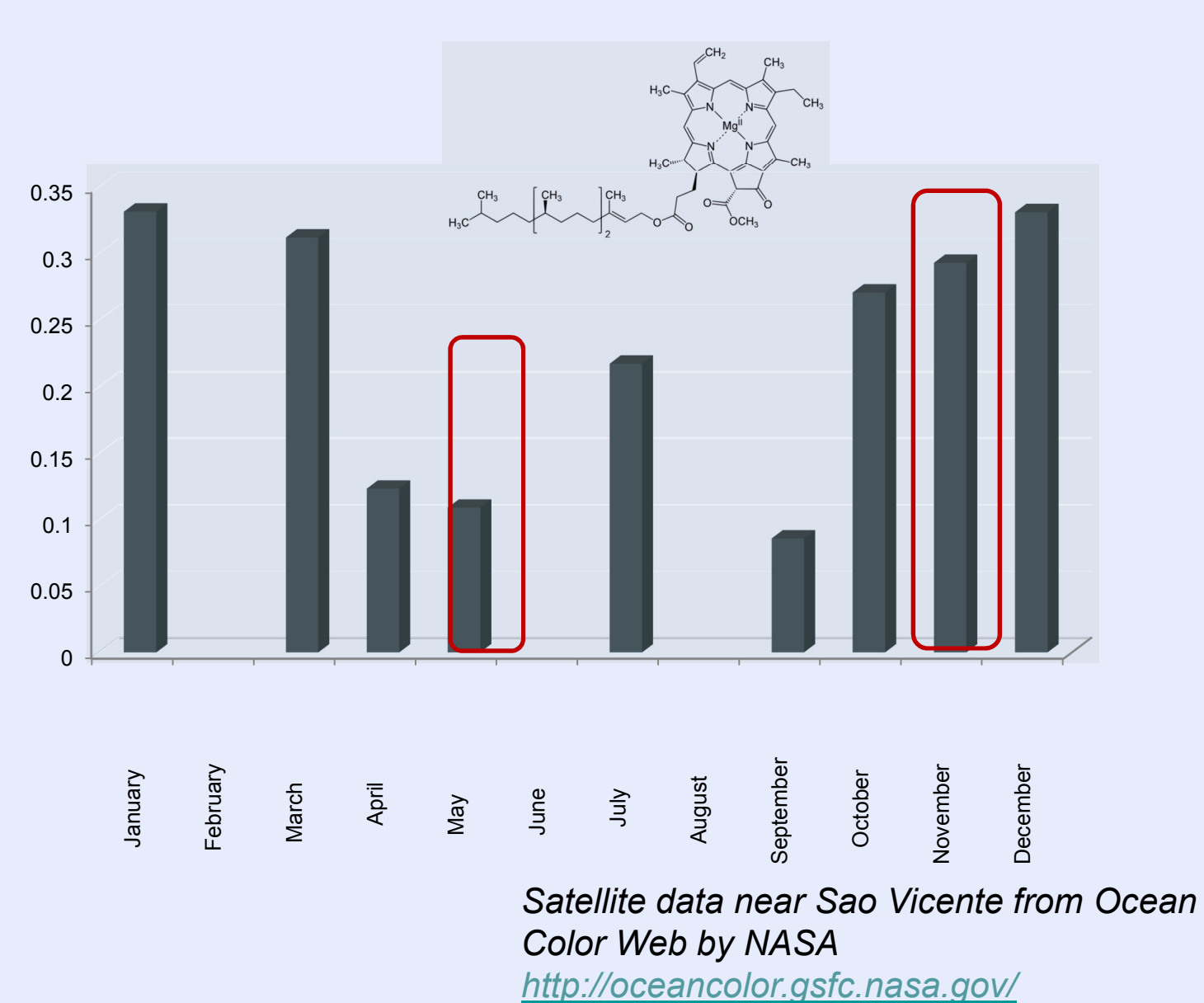
## Results and Discussion

### Backward trajectories



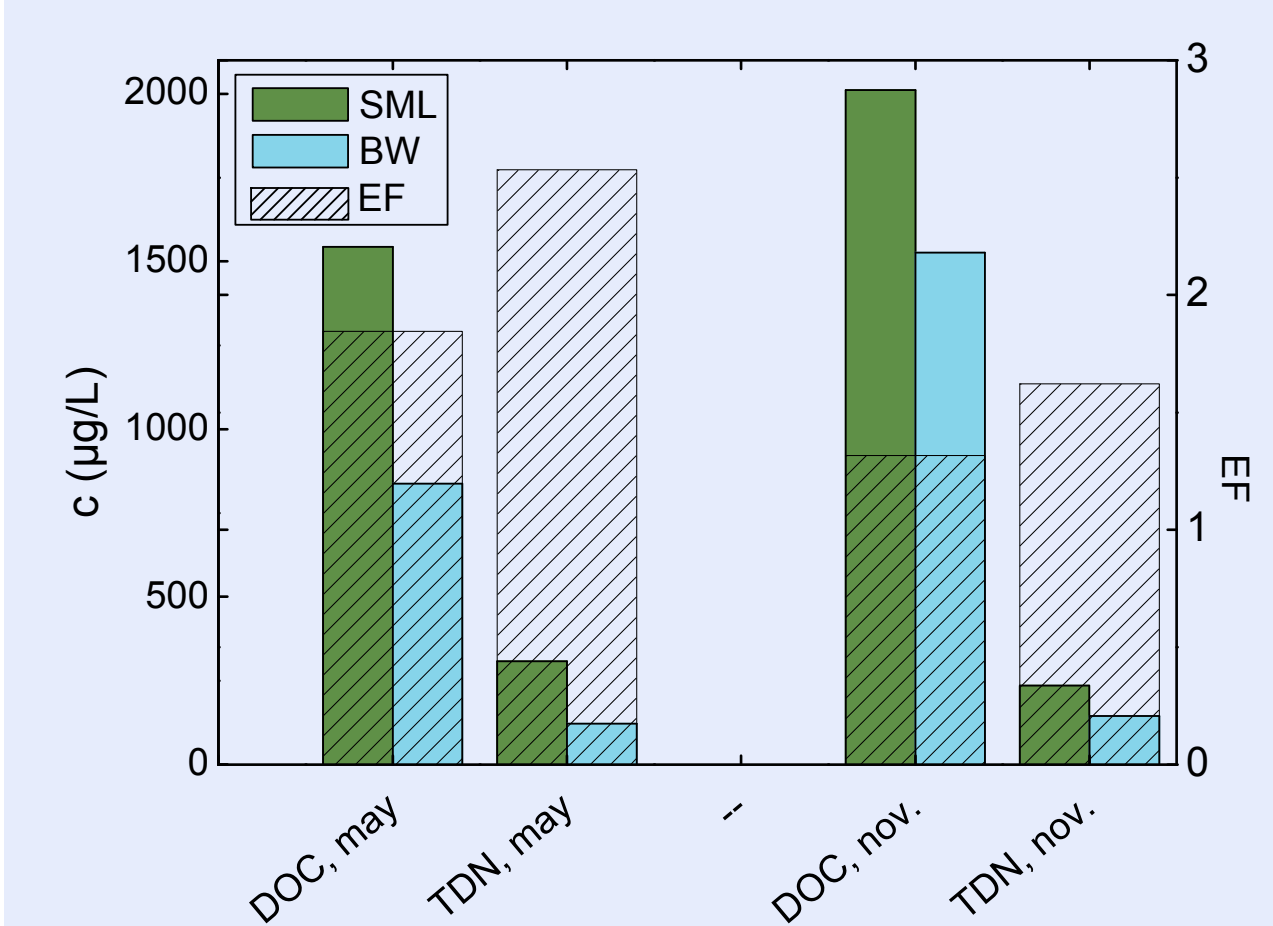
- Air masses are of marine origin

### Chlorophyll a (CHL-a) in 2011



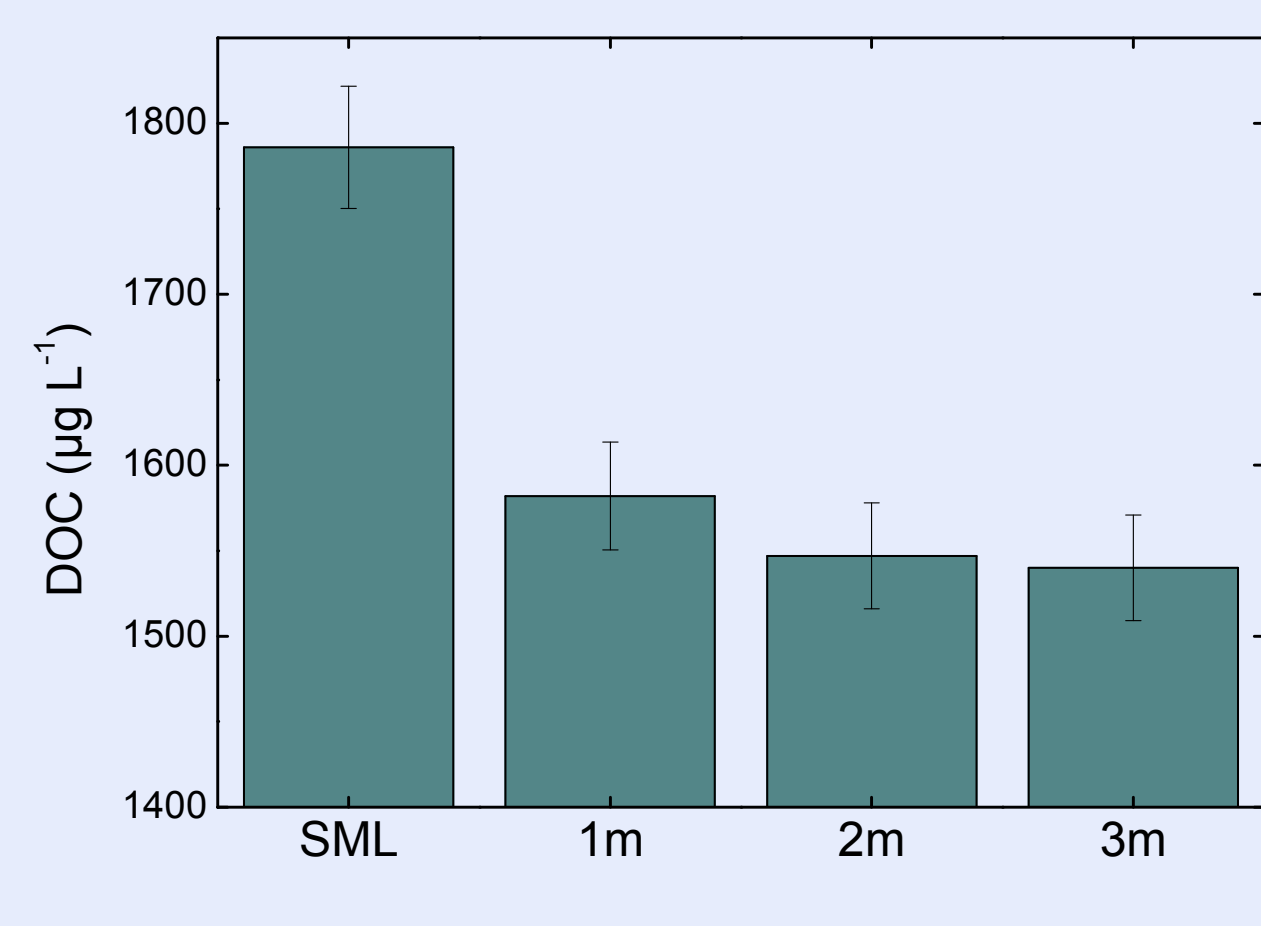
- Lower CHL-a concentration in May 2011 (LBA)
- Higher CHL-a concentration in Nov. 2011 (HBA)

### DOC: I. Seawater



DOC in water concentration and enrichment

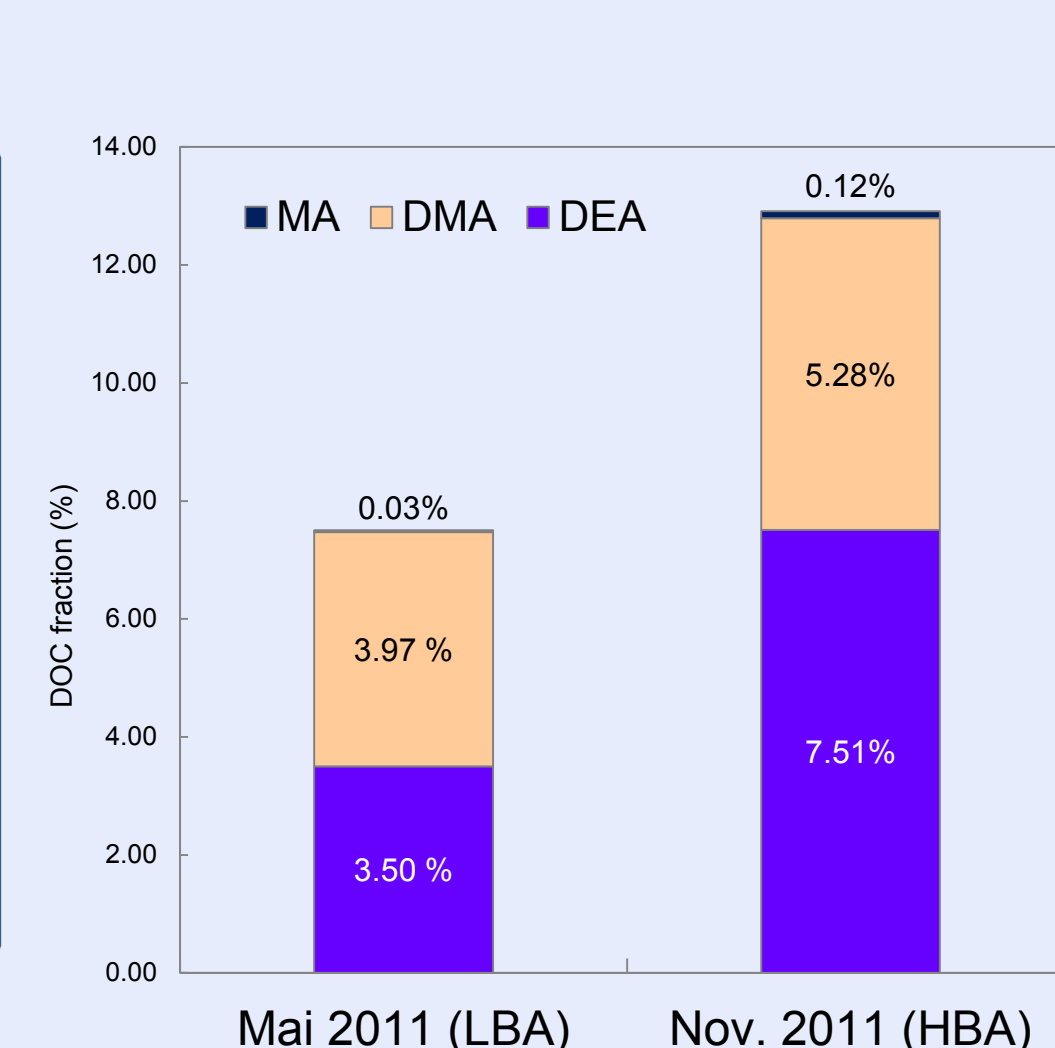
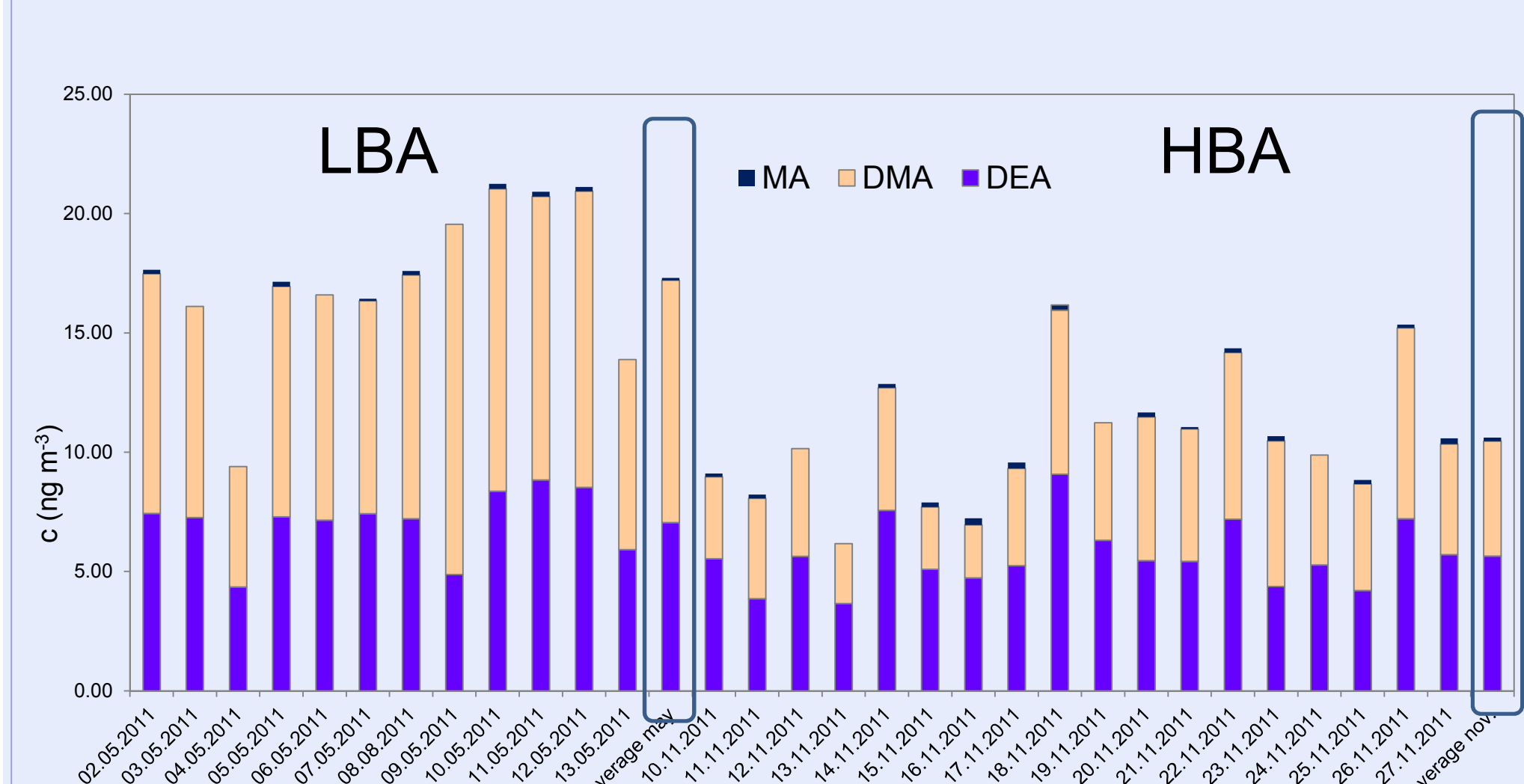
- Higher DOC concentration at HBA
- Higher DOC enrichment at LBA



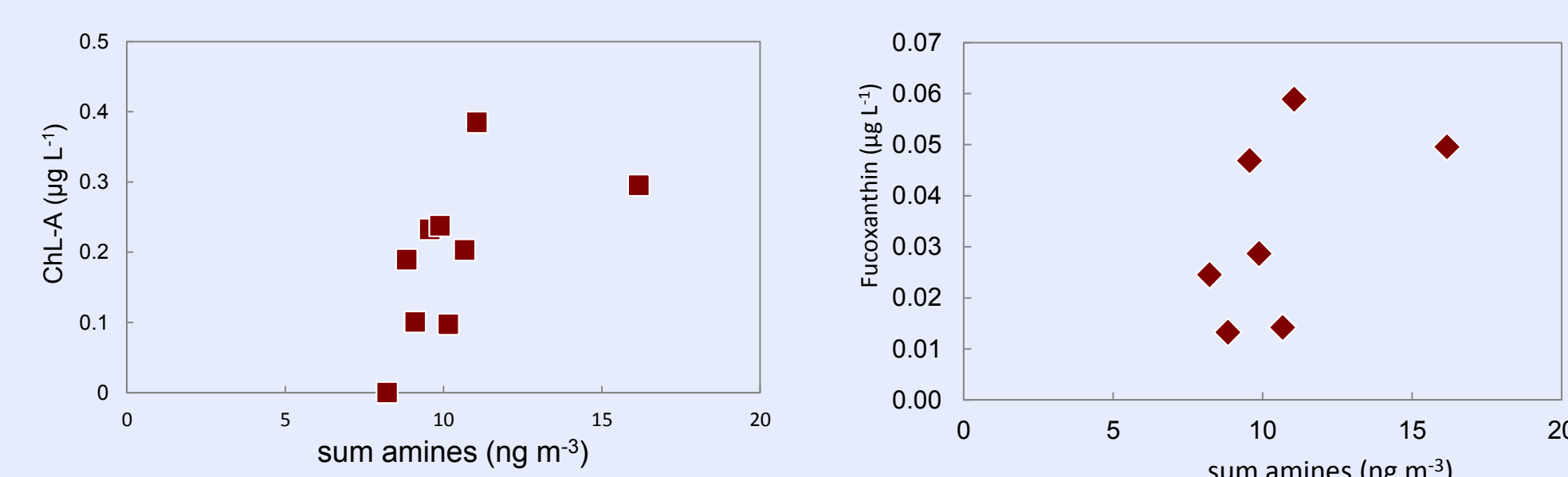
Depth profile of DOC

- Uniform distribution of DOC in bulkwater

### Aliphatic amines on marine aerosol particles



- Slightly higher amine concentration at LBA
- BUT higher DOC contribution of amines at HBA
- Correlation to CHL-a and fucoxanthin (pigment of brown algae [4])



Correlation of amines on aerosol particles and pigments\*

\* values partly between LOD and LOQ

## References and Funding

- [1] Müller et al., Atmos. Chem. Phys. **2009**, 9, (24), 9587  
 [2] van Pinxteren et al., Environ. Sci. Technol., **2012**, 46, 10455.  
 [3] Facchini et al., Environ. Sci. Technol., **2008**, 42, (24), 9116  
 [4] Gibb et al., Deep-Sea Research II, **1999**, 46, 593.

The SOPRAN project was funded by the Bundesministerium fuer Bildung und Forschung (BMBF, FK:03F0662J)

## Summary and Conclusion

- Higher DOC concentration in seawater in times of high CHL-a
- 2-3 fold DOC and TDN enrichment in SML
- Higher relative DOC enrichment in aerosol in times of high CHL-a
- Higher amine concentration in May 2011 (LBA) but higher contribution to DOC on aerosols in November 2011 (HBA)
- Correlation of amines to CHL-a and amine specific pigment fucoxanthin from brown algae

**The ocean might be an important source to DOC and amines on aerosol particles with a strong connection to biological activity**

## Experimental

### Sampling:

#### Seawater

- Glass plate sampling of sea surface microlayer (SML) [2]
- Bulkwater sampling in 1 m depth with a telescope bar

#### Aerosol particles

- High Volume Digital sampler (PM<sub>1</sub> inlet) on top of a 30 m tower at CVAO equipped with quartz filters
- Low volume Derena sampler (PM<sub>1</sub> inlet) on top of a 30 m tower at CVAO equipped with teflon coated quartz filters for amine sampling

### Chemical analysis

#### Dissolved organic carbon (DOC) and total dissolved nitrogen (TDN):

- Total organic carbon analyzer (TOC-V<sub>cph</sub>)
- Detection of DOC as CO<sub>2</sub> with non-dispersive infrared
- Detection of TDN as NO<sub>2</sub> with chemiluminescence

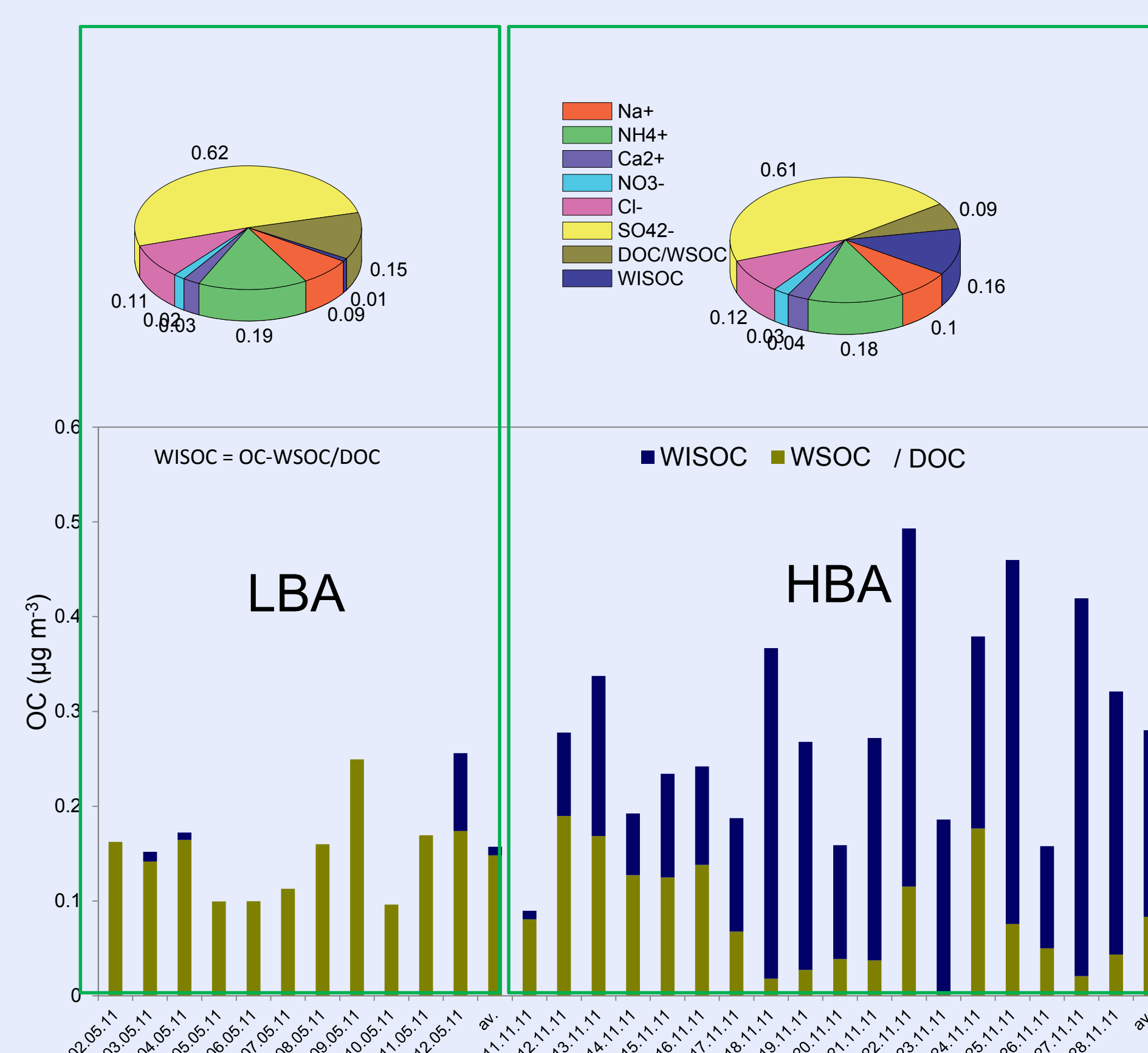
#### Aliphatic Amines:

- Aqueous extraction of filter aliquot
- Analysis with Ion chromatography after Facchini et al. [3]

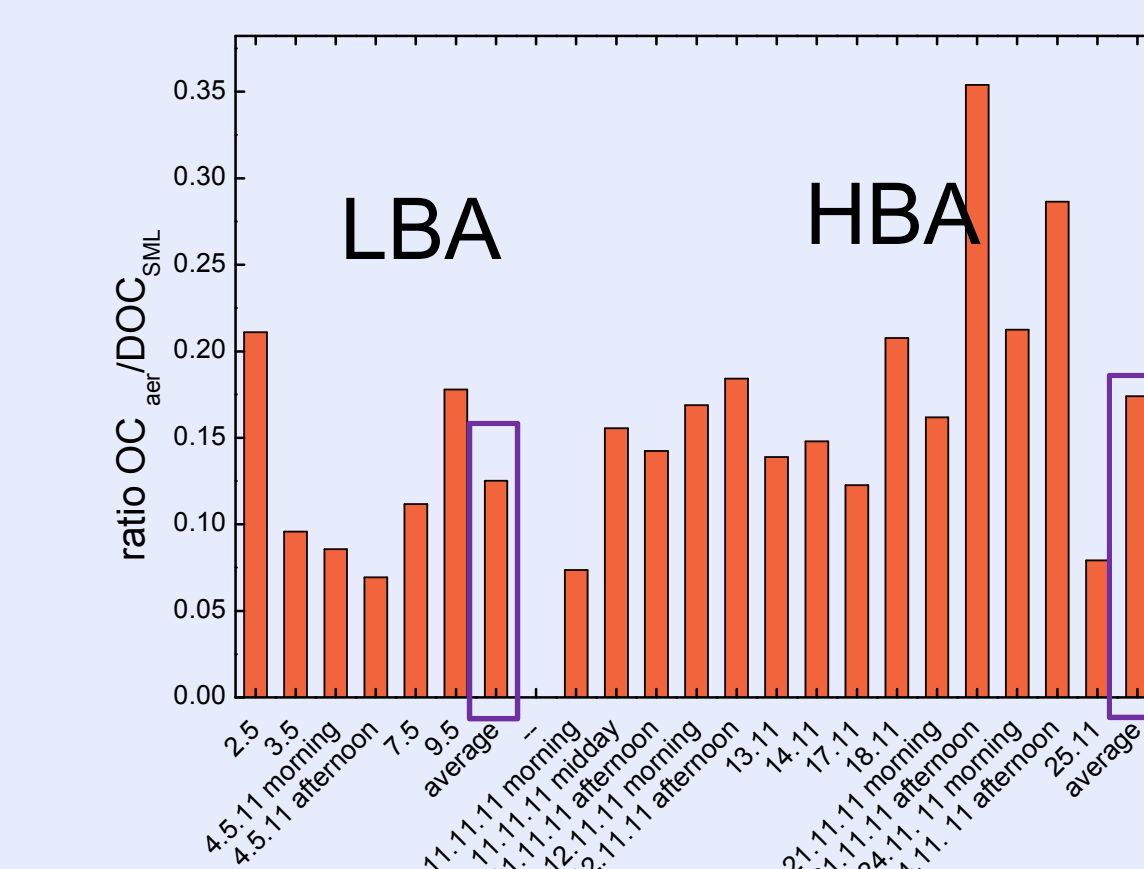
#### Pigment analysis:

- Filtration of seawater (0.5-3 L)
- Extraction of pigments from filter (5 mL ethanol)
- Analysis with HPLC-FLD

### DOC: II. Aerosol particles



### OC in aerosol particle and (D)OC\* in SML



- Similar ion composition in LBA and HBA
- BUT significant higher OC concentration (WISOC) in HBA
- Higher relative aerosol enrichment (30% higher) in HBA