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CHEMICAL CHARACTERIZATION OF THE SEA SURFACE AND AMBIENT MARINE AEROSOLS OF MIDDLE ADRIATIC AREA DURING SPRING AND SUMMER SEASONS

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MARINE AEROSOLS

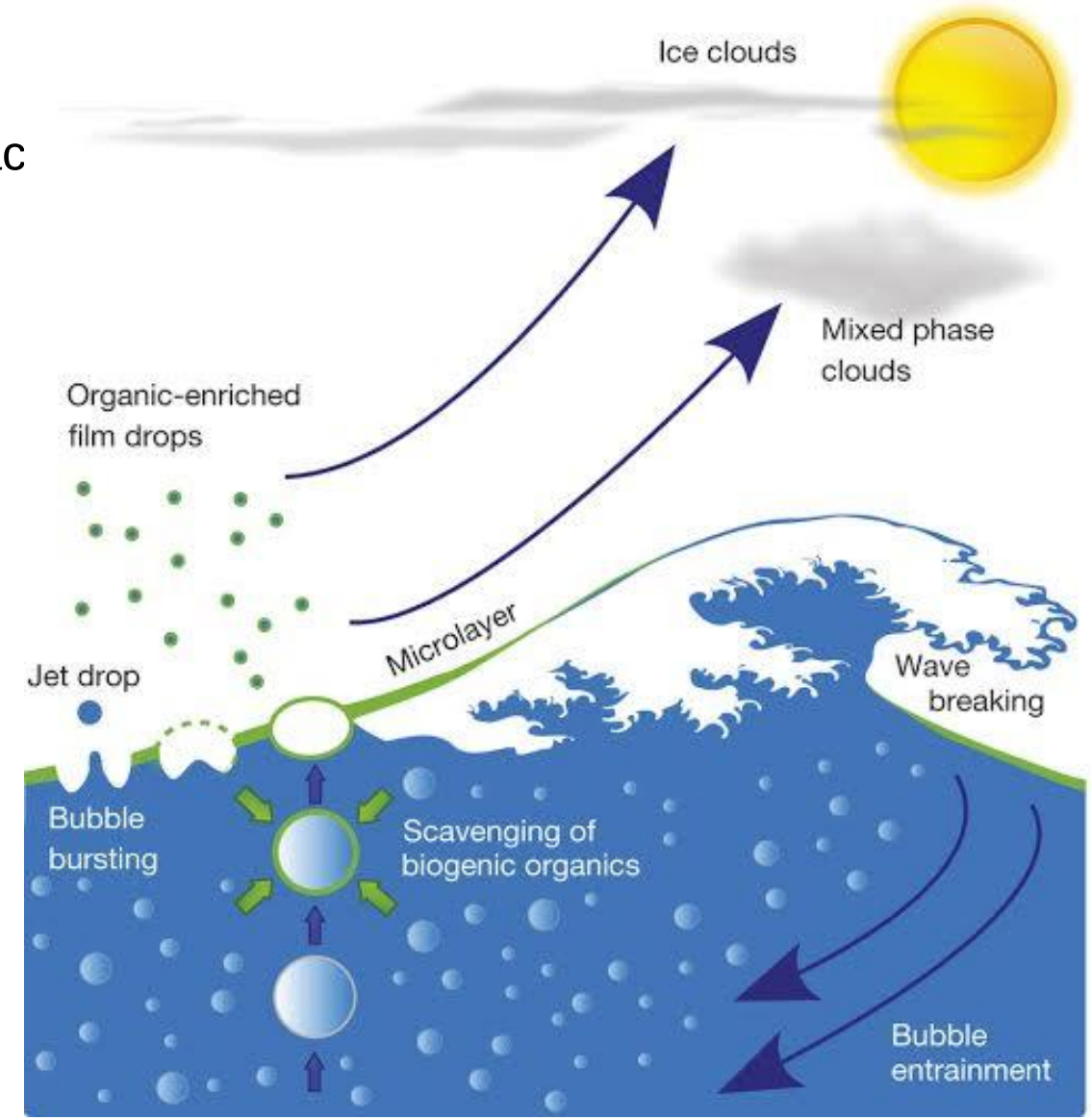
Sea Surface Microlayer

- upper 10-100 μm of the sea surfac
- enriched in organic matter and microorganisms

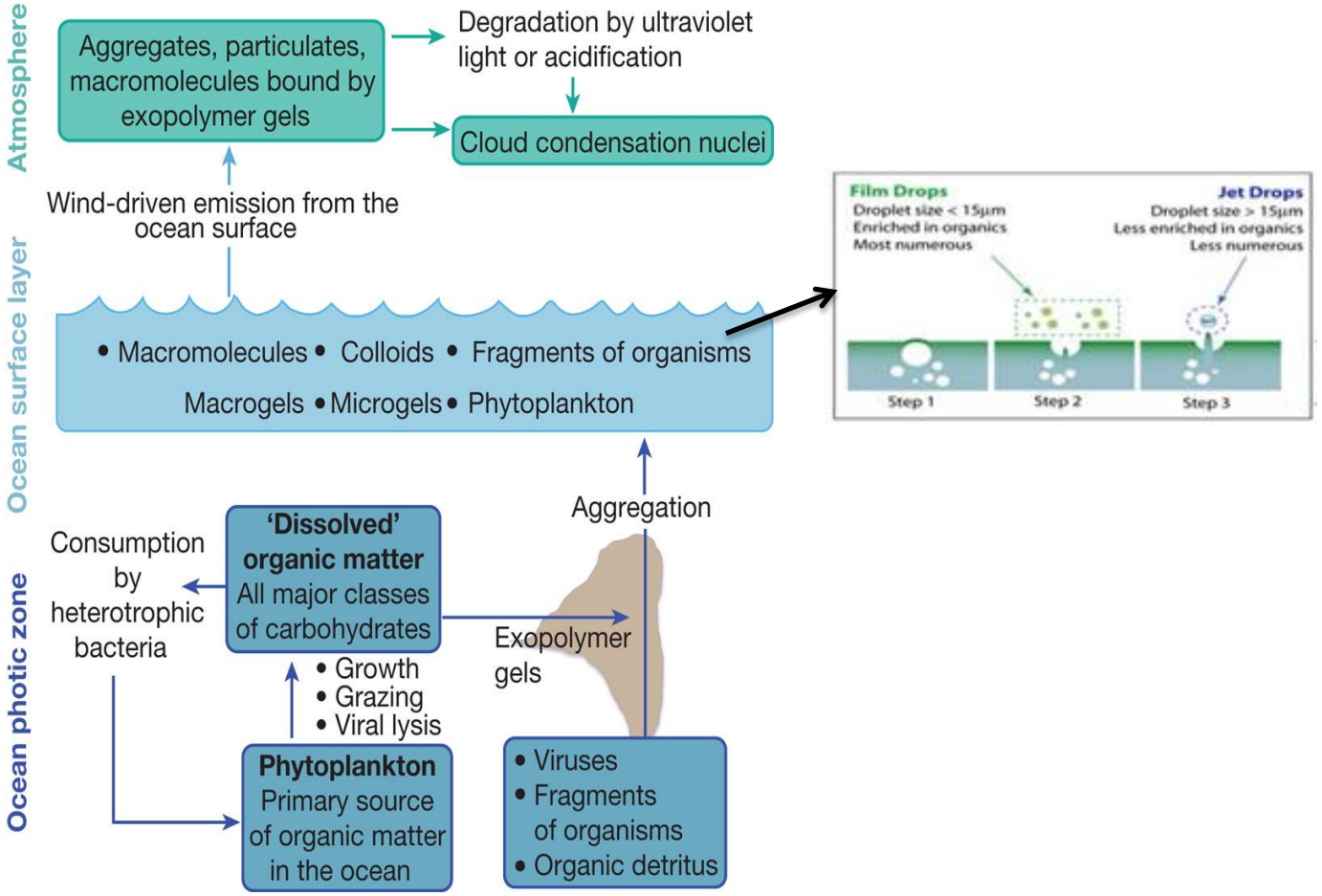
- **Primary Marine Aerosols:**

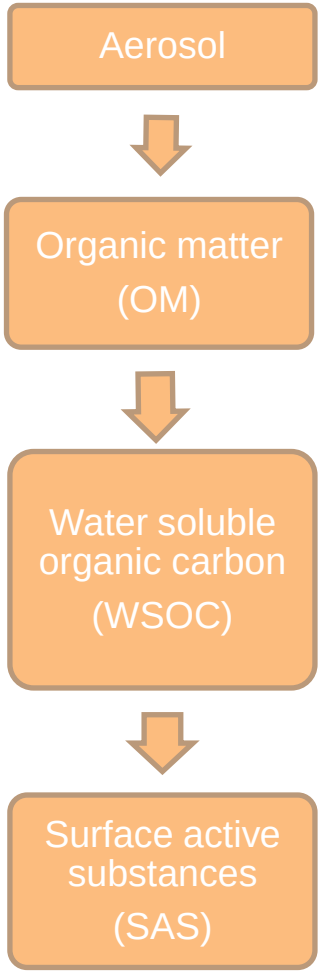
„bubble bursting ” mehanizam

- **Secondary Marine Aerosols:** oxidation of primary aerosols in the thin layer of the air above the sea surface



ORGANIC MATTER IN MARINE AEROSOLS

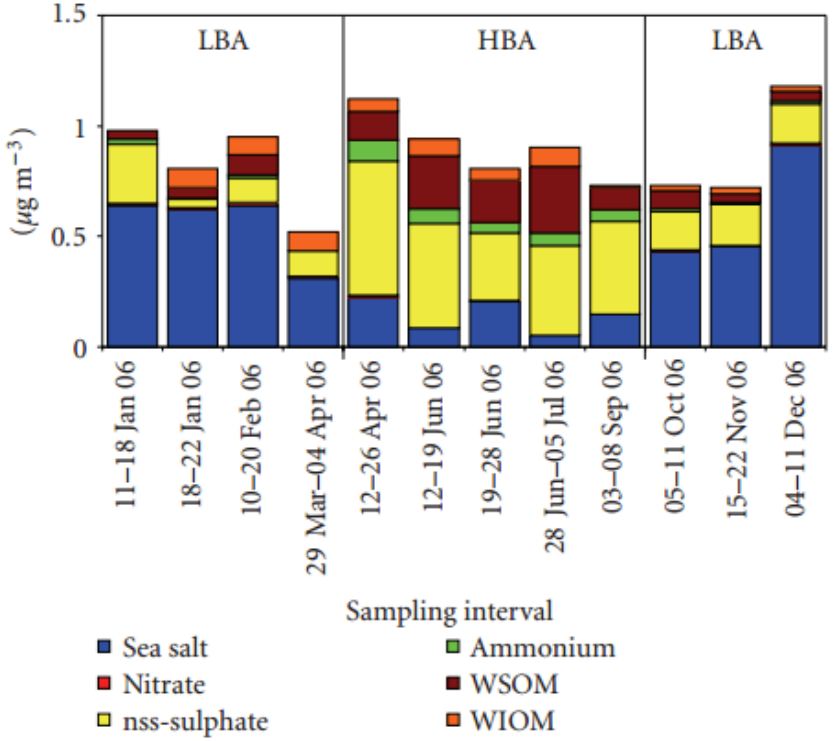




RELATIVE CONTRIBUTION OF THE MAIN MARINE AEROSOL COMPONENTS

- **Season variability**

[%]	HBA ($n = 5$)	LBA ($n = 7$)
$nssSO_4^{-2}$	50 (38–57)	22 (5–27)
NH_4^+	7 (6–9)	1 (0–3)
NO_3^-	(0–1)	1 (1–2)
WSOM	23 (11–33)	6 (0–11)
sea salt	20 (6–25)	65 (59–77)
WIOM	7 (2–10)	6 (2–17)

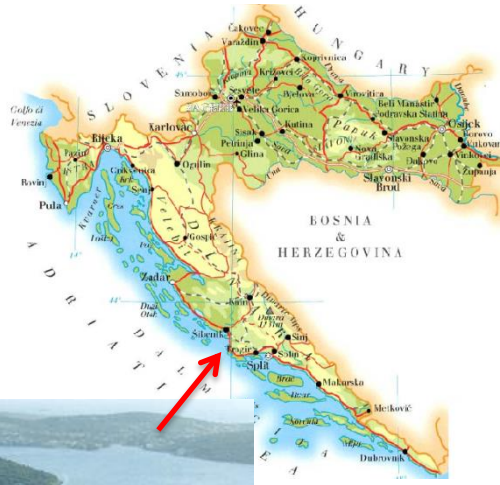


Median, minimum and maximum (in brackets) relative contribution of the main marine aerosol components to the analyzed total mass, expressed as percentage, Mace Head, Ireland 2006.

Rinaldi et al. 2010.

STUDY SITE AND SAMPLING

- Rogoznica Lake in central Dalmatia (43°32'N 15°58'E)
- Samples: Marine aerosol
  - Sea surface microlayer (SML)
  - Underlaying water (ULW)

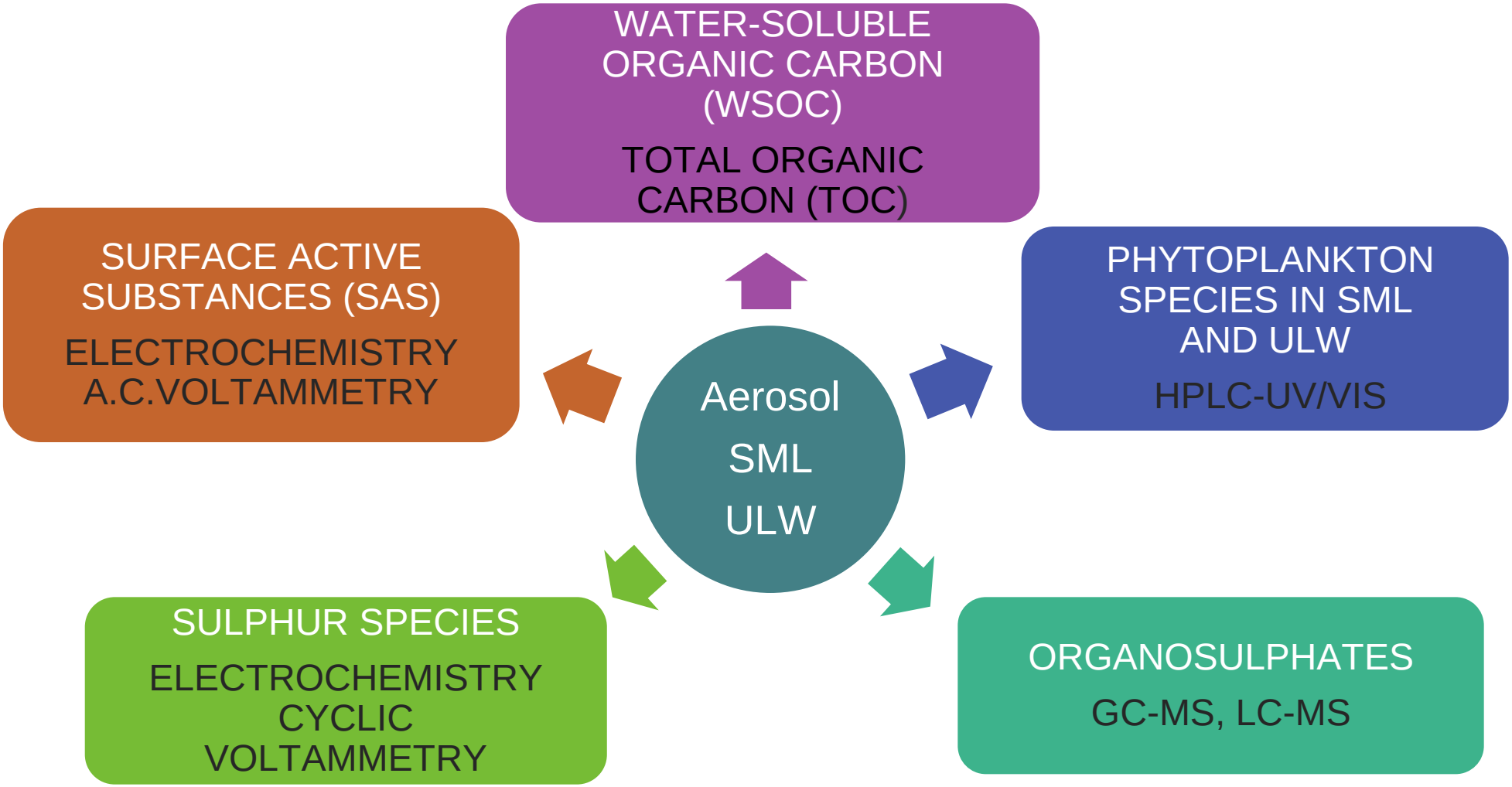


Marine aerosol	
Sampler	SEQ 47/50 Low volume (2.3 m^3/h)
Period of sampling	48 h
Aerodynamic diameter of aerosol particles	2.5 µm
Filters	GF/F (47 mm)

Position of the aerosol sampler

SML (Garrett stainless steel method) and ULW sampling site

SAMPLE ANALYSIS

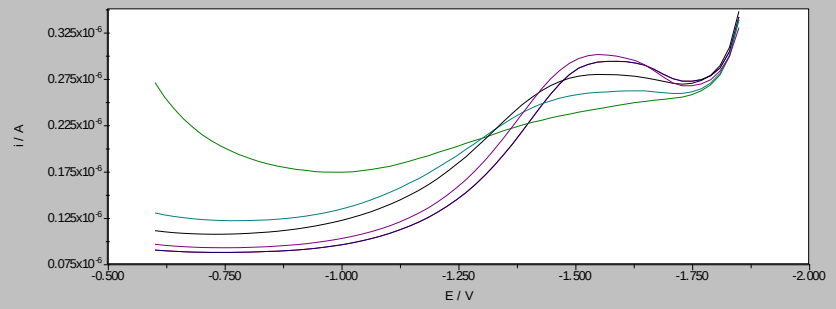


RESULTS AND DISCUSSION:

AC voltammetry-SML and ULW

Spring 2015

SML Spring 2015



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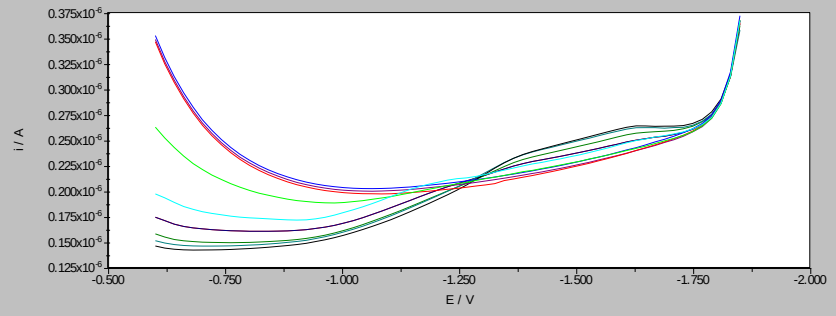
ULW Spring 2015



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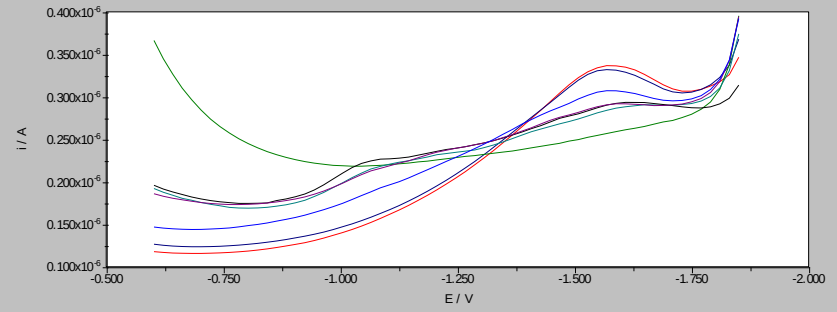
Summer 2015

SML Summer 2015



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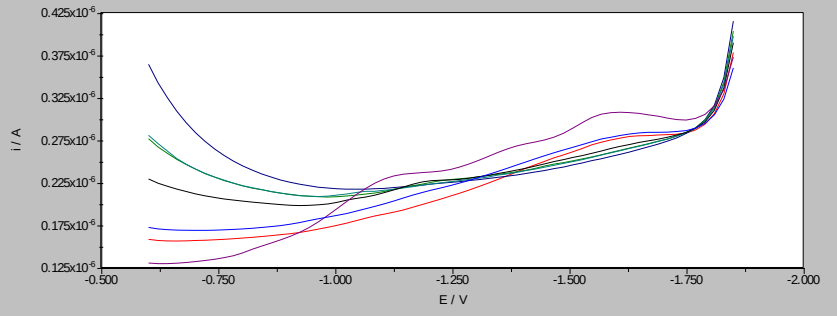
ULW Summer 2015



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Organic matter in SML and ULW: WSOC, POC, TOC, SAS

Spring 2015

Seawater samples	WSOC (mg dm^{-3})	POC (mg dm^{-3})	TOC (mg dm^{-3})	SAS (mg dm^{-3})	SAS/WSOC
▲ SML	3,189	7,912	11,101	1,584	49,6 %
▼ ULW	0,937	0,133	1,0698	0,162	17,2 %

Summer 2015

Seawater samples	WSOC (mg dm^{-3})	POC (mg dm^{-3})	TOC (mg dm^{-3})	SAS (mg dm^{-3})	SAS/WSOC
▲ SML	2,542	3,930	6,472	1,395	54,9 %
▼ ULW	0,978	0,188	1,166	0,191	19,5%

Accumulation of Nutrients and Ions in SML and ULW

Spring 2015

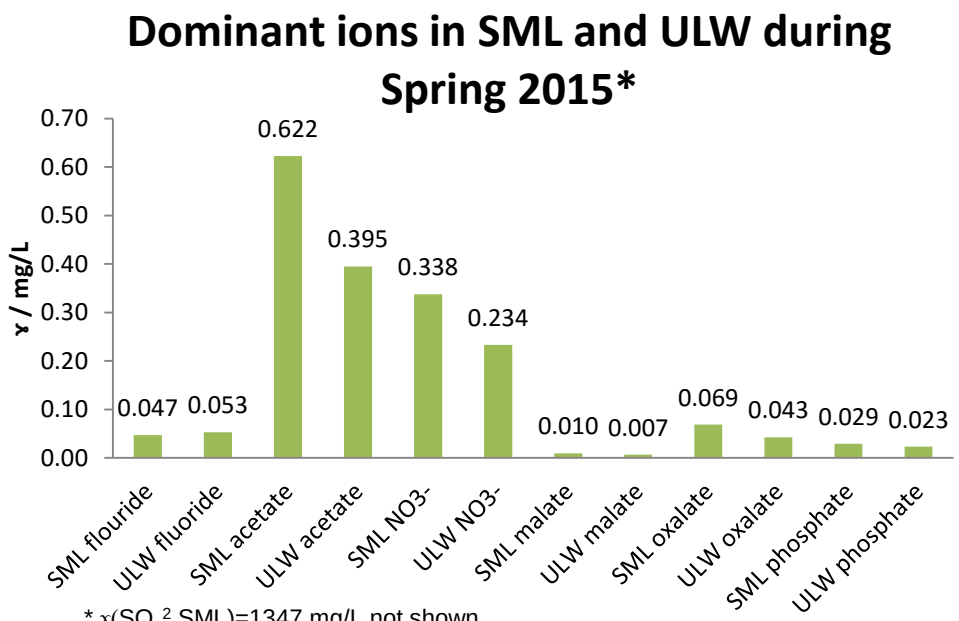
Enrichment factor=13.04

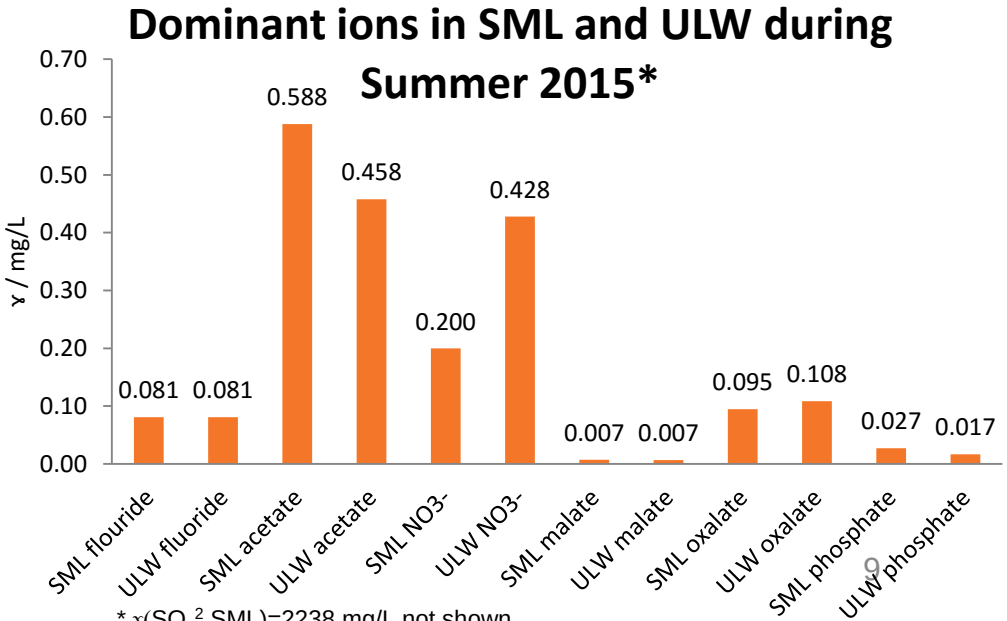
Nutrients	NH_4^+ (µM)	NO_2^- (µM)	NO_3^- (µM)	TIN (µM)	PO_4^{3-} (µM)	SiO_4^{4-} (µM)
SML	8,230	0,207	0,463	8,900	4,000	39,603
ULW	0,968	0,037	0,293	1,298	0,096	6,811

Summer 2015

Enrichment factor= 4.05

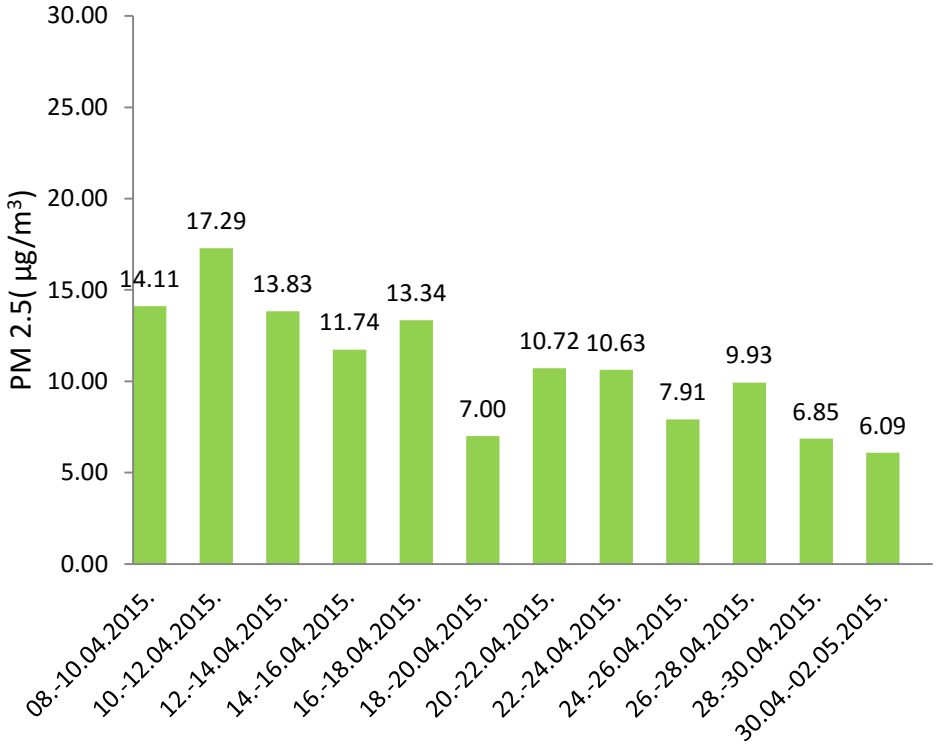
Nutrients	NH_4^+ (µM)	NO_2^- (µM)	NO_3^- (µM)	TIN (µM)	PO_4^{3-} (µM)	SiO_4^{4-} (µM)
SML	1,956	0,060	0,000	2,016	1,202	5,590
ULW	0,608	0,040	0,000	0,648	0,243	3,330



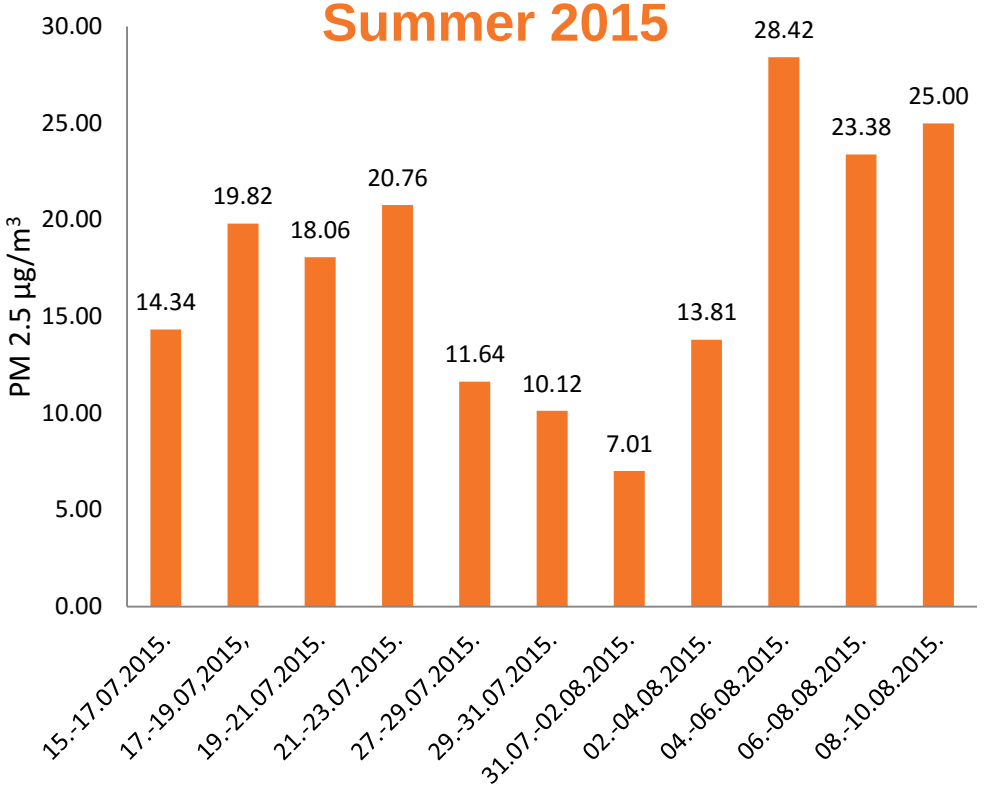


The temporal distribution of pm 2.5 in the marine aerosols during spring and summer 2015

Spring 2015

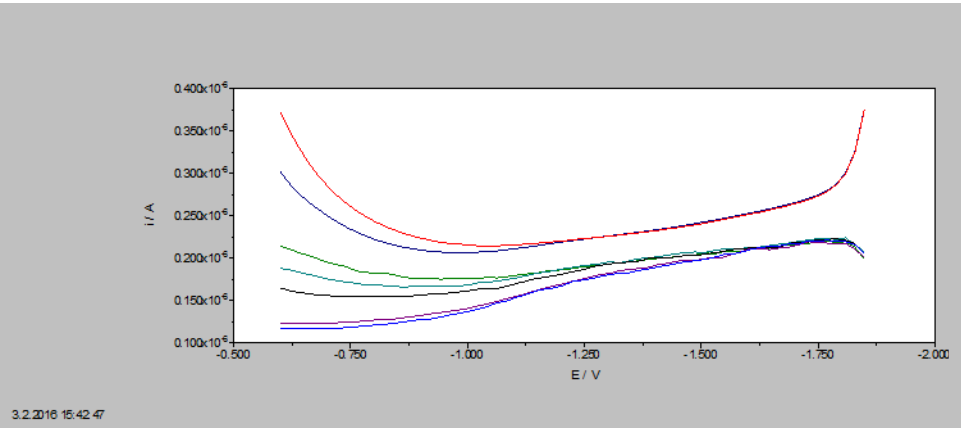


Summer 2015

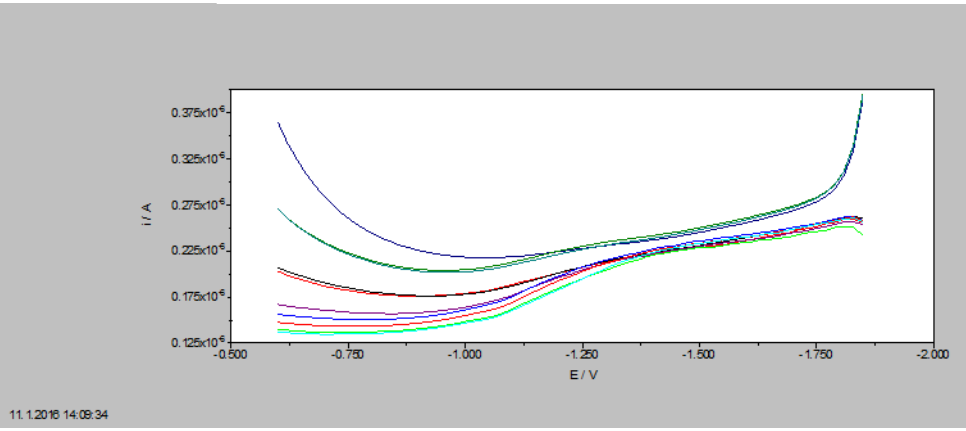


AC voltammetry-Marine aerosols

Spring 2015



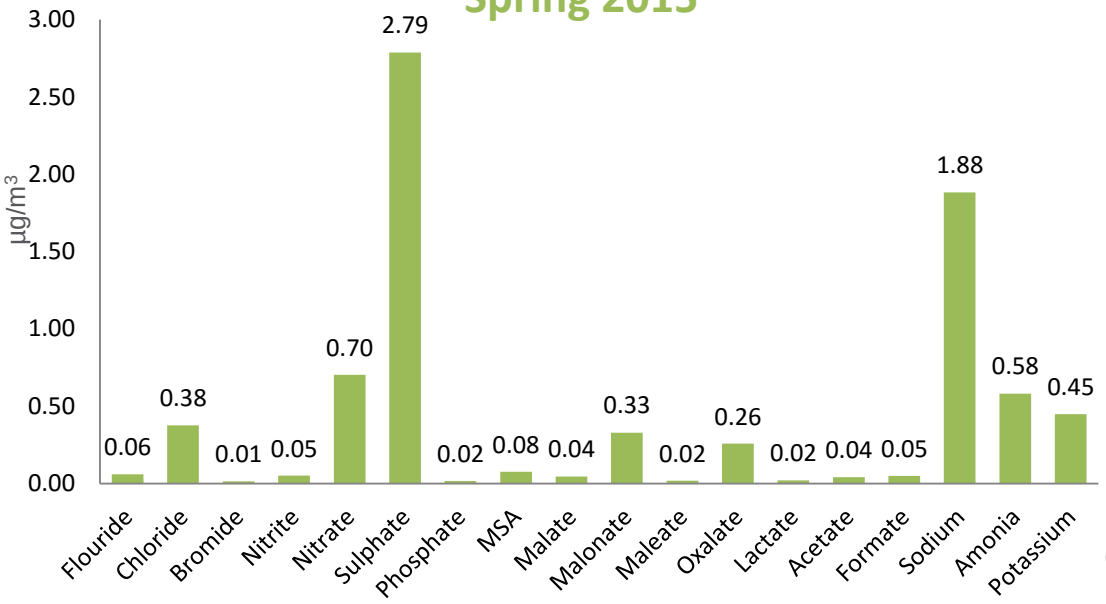
Summer 2015



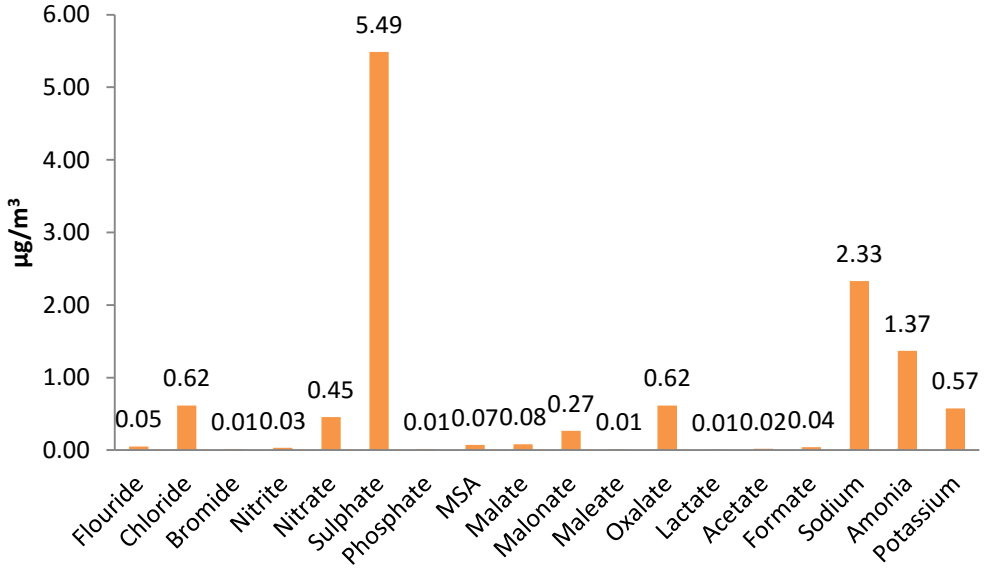
	WSOC (mg dm^{-3})	TOC (µg m^{-3})	SAS (µg m^{-3})	SAS/WSOC
Spring	2,038	3,376	0,482	23,64 %
Summer	2,746	4,171	0,501	18,51 %

MARINE AEROSOLS: IONS

Spring 2015



Summer 2015



CONCLUSIONS

- Preliminary results show the presence of more hydrophilic material in WSOC fraction of marine aerosol samples in Rogoznica Lake in spring and summer period. This is in contrast to the strongly hydrophobic surfactant material present in urban aerosols in winter and autumn period.

- A comparision of the AC voltammetric curves obtained SML and ULW samples from Rogoznica Lake collected during spring and summer period indicate variability in the nature organic matter.

- Spring aerosol samples were characterized by lower PM mass, TOC, WSOC, SAS and inorganic ion concentrations (F^-, Cl^-, Br^-, NO_2^-, NO_3^-, SO_4^{2}, PO_4^{3-}, Na^+, K^+, NH_4^+) in comparison to the summer samples.

- At the same time, higher enrichment factors (EFs) were obtained for particulate and dissolved organic carbon, nutrients and SAS of the spring SML samples, indicating a recent phytoplankton bloom and accumulation of OM within the SML.

Future prospectives: additional characterization of aerosol samples by chromatography techniques

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