

# Organic matter in atmospheric aerosol over Zagreb (Croatia): seasonal variation and characterisation of physicochemical properties

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## INTRODUCTION

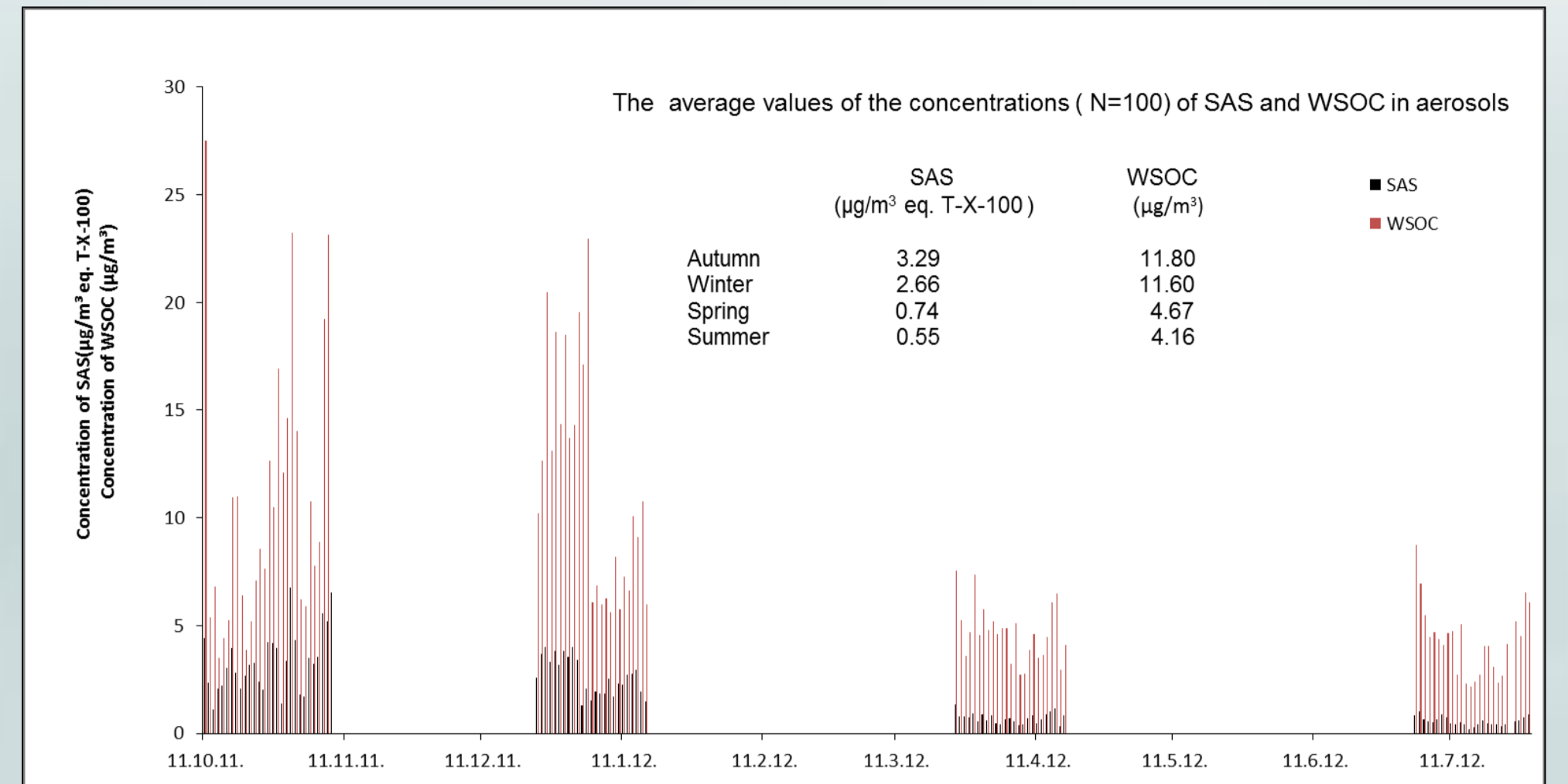
Water-soluble organic carbon (WSOC) is a large (20-80%) component of carbonaceous atmospheric aerosols that can absorb solar light and enhance cloud formation, influencing both the direct and indirect climate effects of the aerosols.

Surface active substances (SAS) contribute to the amount of organic compounds and play a role in the control of atmospheric processes. SAS form surface films which can change the physicochemical properties of humid aerosol particle.

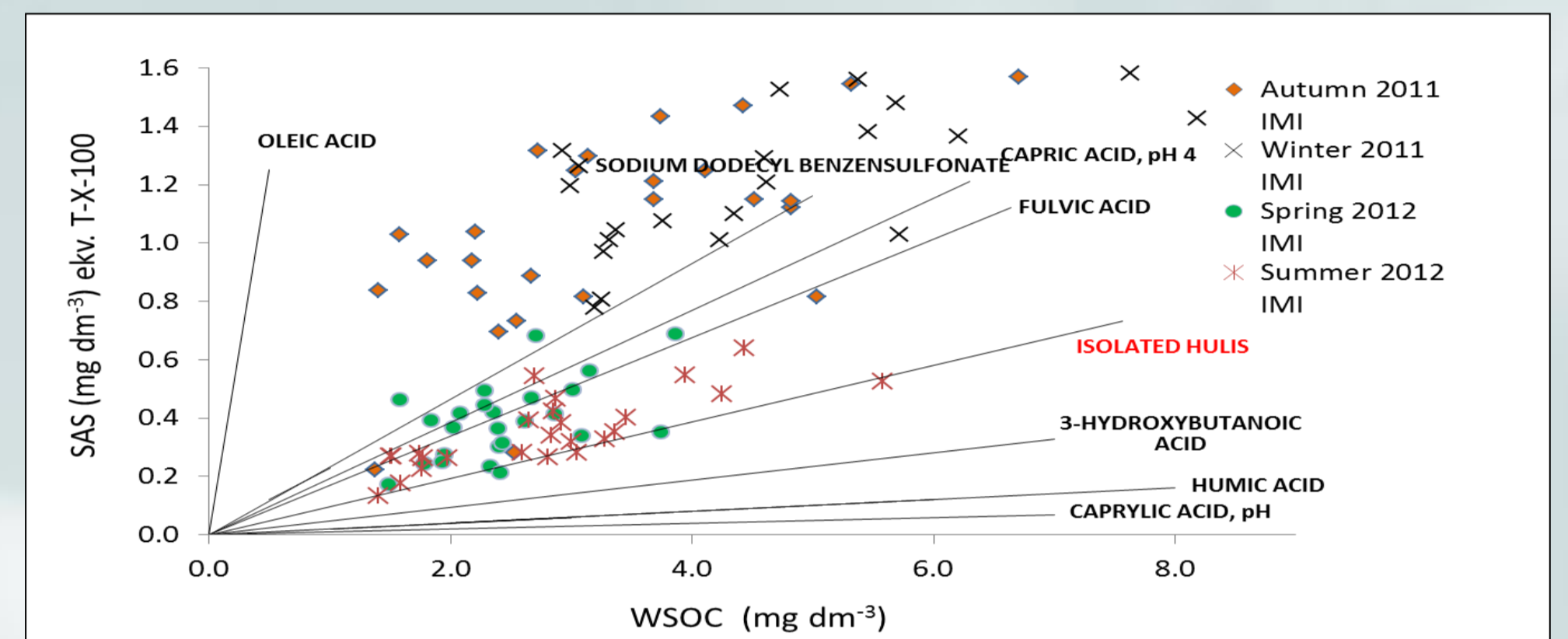
Atmospheric humic substances (**HU**mic-**L**ike **S**ubstances, HULIS) were found to be the most effective surface-active species within the atmospheric droplets.

The present study describes results by specific focusing on the seasonal variability of surfactant properties of the atmospheric aerosol WSOC fraction (PM < 10 μm) collected during one year (2011-2012) in urban area of Zagreb.

## Temporal distribution of SAS and WSOC in the atmospheric aerosols over Zagreb



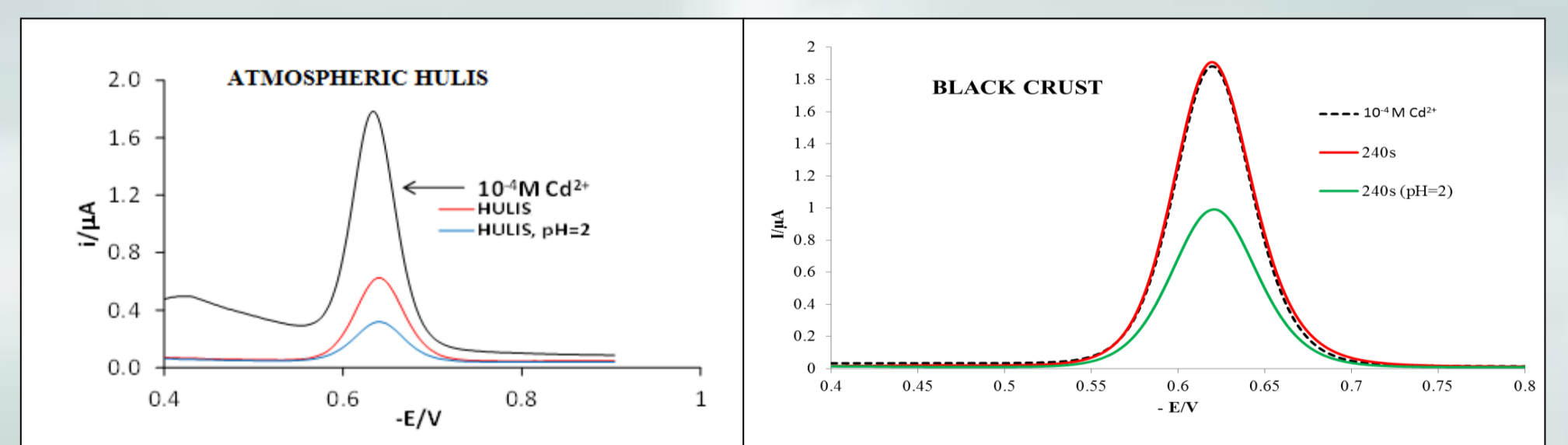
## The relationship of SAS vs. WSOC for aerosol samples was compared with relevant model substances



## Influence of the aerosols on surfaces in the environment: Water soluble organic fraction of black crusts from cathedral of Zagreb

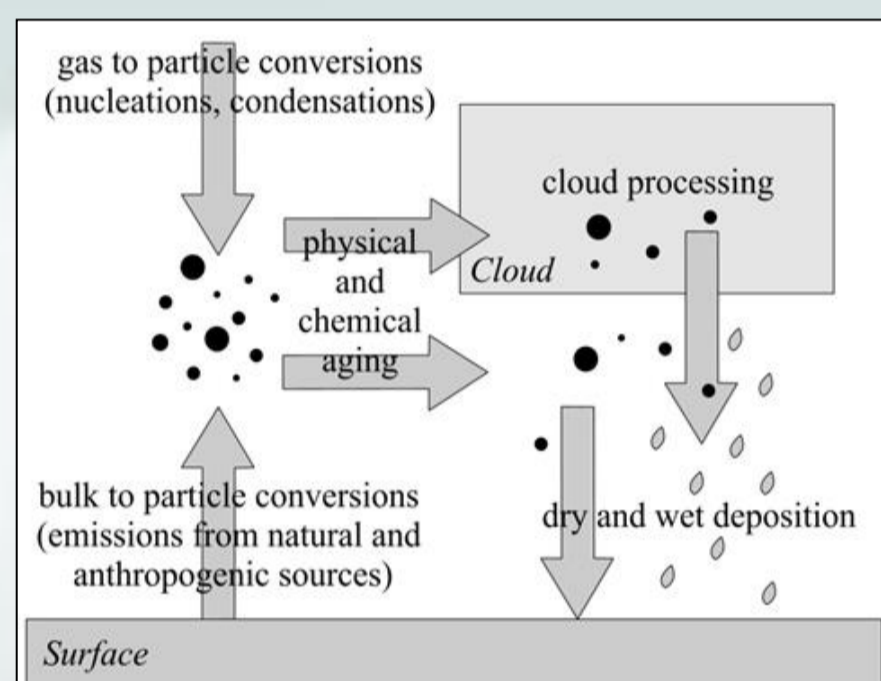


## Oxidation of soot in the atmosphere or on the surfaces of stone monuments can produce HULIS.



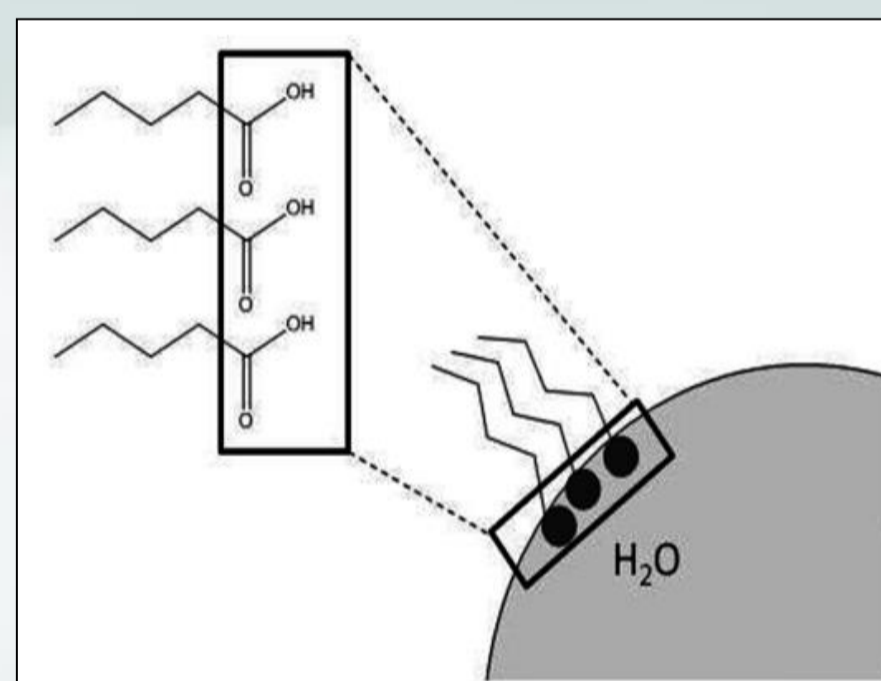
The strong inhibition of the Cd<sup>2+</sup> electrode reaction was measured in atmospheric HULIS. Similar effect was observed in the water soluble fraction of the black crust from Zagreb cathedral.

## Atmospheric cycles of aerosol particles



URL: <http://elte.prompt.hu/sites/default/files/tanyanyagok/atmospheric/ch09.html>

## SAS - organic compounds with long hydrocarbon chains and polar groups



URL: [http://oatd.org/oatd/img\\_viewer?record=handle%5C%3A10022%2FAC%5C%3AP%5C%3A14891&img=image-2.png](http://oatd.org/oatd/img_viewer?record=handle%5C%3A10022%2FAC%5C%3AP%5C%3A14891&img=image-2.png)

## METHODOLOGY

### WSOC CONCENTRATION

The concentration of the WSOC are measured as dissolved organic carbon (DOC) in the filtered solutions using a high-temperature catalytic oxidation (HTCO) technique.

### SAS CONCENTRATION

Phase sensitive ac. voltammetry (out-of-phase) was used for quantification of SAS. Surfactant activity is expressed as the equivalent amount of the selected standard T-X-100 compound.

### ELECTROCHEMICAL PROBE

Phase sensitive ac. voltammetry (in-phase) was used to investigate the influence of adsorbed SAS layers on cathodic processes of Cd<sup>2+</sup> ions.

## CONCLUSION

Distribution and seasonal variability of WSOC and SAS were studied in aerosols samples collected from 2011 to 2012 at the area of continental urban city of Zagreb (Croatia):

- The average concentration of WSOC was 7.44 μg m<sup>-3</sup> (range from 1.83 μg m<sup>-3</sup> to 27.5 μg m<sup>-3</sup>). The seasonal variation of WSOC concentrations was observed with the highest value in autumn (11.80 μg m<sup>-3</sup>) and the lowest in summer (4.16 μg m<sup>-3</sup>).
- The concentrations of SAS in WSOC fraction were in the range from 0.19 to 6.76 μg m<sup>-3</sup> eq. Triton-X-100 with the average concentration of 1.99 μg m<sup>-3</sup> eq. Triton-X-100. The lowest value of SAS was measured in summer (0.55 μg m<sup>-3</sup> eq. Triton-X-100) and the highest in autumn (3.29 μg m<sup>-3</sup> eq. Triton-X-100).
- The characterization of WSOC fraction of aerosol samples was evaluated by comparison with selected model substances.
- HULIS matter may play an important role in atmospheric aerosols during warm seasons.
- The presence of HULIS material was also detected in the brownish crust of cathedral of Zagreb. The increased organic content may have noticeable aesthetic impact by changing the color of buildings to brown and yellow tones.

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