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Seasonal evolution of anionic, cationic and non-ionic surfactant concentrations in coastal aerosols from Askö, Sweden

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Surfactants present in atmospheric aerosols are expected to enhance the activation into cloud droplets by acting on one of the two key parameters of the Köhler equation: the surface tension, σ. But because the magnitude of this effect and its regional and temporal variability are still highly uncertain [1,2], various approaches have been developed to evidence it directly in the atmosphere. This work presents the analysis of surfactants present in PM2.5 aerosol fractions collected at the coastal site of Askö, Sweden (58° 49.5' N, 17° 39' E) from July to October 2010. The total surfactant fraction was extracted from the samples using an improved double extraction technique. Surface tension measurements performed with the pendant drop technique [3] indicated the presence of very strong surfactants ($\sigma \sim$ 30 - 35 mN/m) in these aerosols. In addition, these extractions were combined with colorimetric methods to determine the anionic, cationic and non-ionic surfactant concentrations [4,5], and provided for the first time interference-free surfactant concentrations in atmospheric aerosols. At this site, the total surfactant concentration in the PM2.5 samples varied between 7 to 150 mM and was dominated by anionic and non-ionic ones. The absolute surface tension curves obtained for total surfactant fraction displayed Critical Micelle Concentrations (CMC) in the range 50 - 400 uM, strongly suggesting a biological origin for the surfactants. The seasonal evolution of these concentrations and their relationships with environmental or meteorological parameters at the site will be discussed.

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