Session 03

A case study of aerosol trace element deposition to Moroccan coastal waters: Lessons from the AWA Project

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Abstract

Aerosol deposition is an important source of trace elements (TEs) to the surface ocean. Due to the proximity to the Sahara and Sahel Deserts, the North Atlantic receives some of the highest inputs of mineral dust globally (~100-220 Tg yr-1). In terms of biological production, this significant input of TEs contributes to the greater efficiency of the Canary Current Eastern Boundary Upwelling System (CC-EBUS) relative to its Pacific counterpart; both of which support socio-economically important fisheries. However, mineral dust is just one component of atmospheric aerosols. Human activities (e.g. fossil fuel combustion, agricultural practices) also contribute to the atmospheric load, resulting in changes in the elemental ratios with respect to crustal composition. In order to investigate the TE composition of aerosols to the CC-EBUS, aerosol samples were collected from three coastal locations in Morocco (Agadir, Laayoune and Dakhla) as part of the EPURE project, over an annual cycle (March 2015-2016). Here, we present TE composition data, with a focus on cadmium (Cd); an element of concern for human health, which is toxic to phytoplankton above a certain threshold, despite being essential for carbon uptake in some genera. A poor correlation between aerosol aluminium (Al; a tracer for mineral dust inputs) and Cd ($r^2 = 0.31$, $P = 0.091$) suggests that mineral dust was not the dominant source of Cd during this study. However, coincident peaks of Al and Cd did occur occasionally, suggesting that during dust events mineral dust could be an important source of Cd. In addition, despite the presence of phosphate mining activities south of Laayoune, we did not observe significantly different ratios of Cd/Al

relative to the other two stations. Using aerosol samples collected during the AWA campaigns off Senegal (2013, 2014) we have estimated the solubility of TEs from West African/European aerosols to provide an estimate of the flux of potentially bioavailable TEs for marine micro-organisms.

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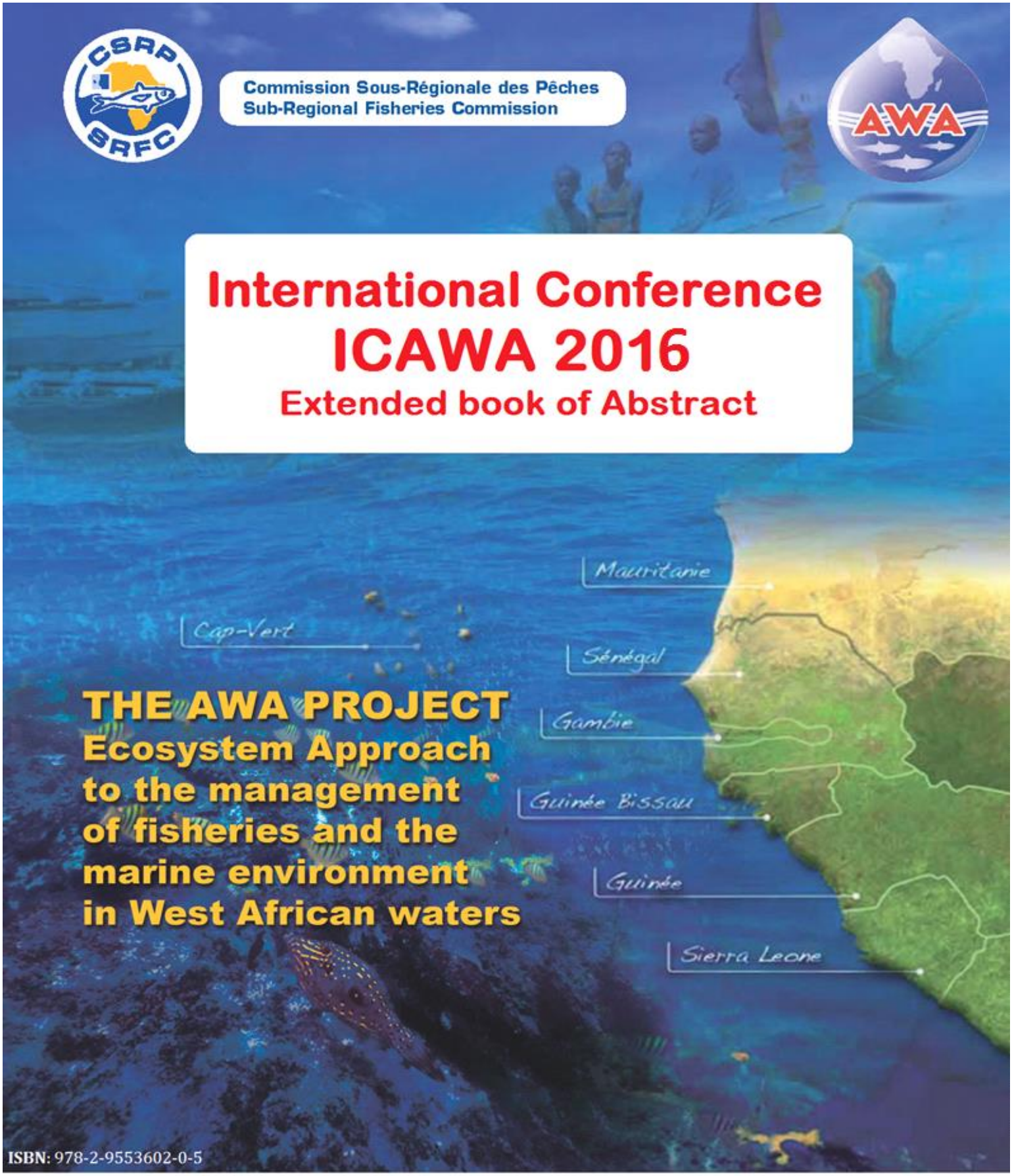

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