

Dissolved aluminium in the west Atlantic Ocean and Mediterranean Sea

ROB MIDDAG^{1*}, JOHN M. ROLISON¹,
CLAUDINE H. STIRLING¹, MARCO M. P. VAN HULTEN²,
MICHA J. A. RIJKENBERG³, LOES J. A. GERRINGA³ AND
HEIN J. W. DE BAAR³

¹Department of Chemistry, University of Otago, Dunedin, New Zealand (*correspondence: rob.middag@otago.ac.nz, john.rolison@otago.ac.nz, cstirling@chemistry.otago.ac.nz)

²Laboratoire des Sciences du Climat et de l'Environnement (LSCE), Gif-sur-Yvette, France (marco.van-hulten@lsce.ipsl.fr)

³Royal Netherlands Institute for Sea Research, Den Burg, The Netherlands (micha.rijkenberg@nioz.nl, loes.gerringa@nioz.nl, hein.de.baar@nioz.nl)

Dissolved aluminium (Al) is a GEOTRACES key element and is an important tracer of atmospheric dust to the oceans. A wealth of new data has been generated in recent GEOTRACES expeditions to the Atlantic Ocean and Mediterranean Sea. As a particle reactive element, the distribution of Al is inherently linked to the biological cycle via scavenging onto biogenic particles. The link between Al and the biological cycle is sometimes observed in a correlation between Al and silicate (Si), however, this is by no means a global observation. Often there is no correlation or an inverse rather than a positive correlation. Based on the recent data we can now demonstrate there is a coupling between Al and the biological cycle of an elusive nature. In the West-Atlantic this coupling is observed from correlations with Si and a remineralisation signal in the oxygen minimum zone near the equator. The long known correlation between Al and Si has been re-examined based on the new data. Based on this it is now evident this correlation is mainly related to water mass mixing, rather than being direct evidence for a coupled cycling. Interestingly though, in the confined Mediterranean basin, the mixing water masses are pre-cursors to, or originate from each other. This implies there must be an overarching process that transports Al and Si from the surface to the deep where any addition of one element is accompanied by an addition of the other in a constant ratio. Besides the biological coupling, the new data combined with modelling studies also demonstrates the importance of sediment resuspension for the Al concentrations in the deep ocean. Furthermore, surface concentrations in the Mediterranean are strongly correlated to salinity, implying rapid dispersion of any Al from deposited dust.