Evaluation of labile iron processing in atmospheric models

AKINORI ITO[1]* STELIOS MYRIOKEFALITAKIS[2], MARIA KANAKIDOU[3], NATALIE MAHOWALD[4], ALEX BAKER[5], TIM JICKELLS[5], MANMOHAN SARIN[6], SRINIVAS BIKKINA[7], YUAN GAO[8], RACHEL SHELLEY[9], CLIFTON BUCK[10], WILLIAM LANDING[9], ANDREW BOWIE[11], MORGANE PERRON[11], NICHOLAS MESKHIDZE[12], MATTHEW JOHNSON[13], YAN FENG[14] AND ROBERT DUCE[15]

[1] JAMSTEC, Yokohama, Kanagawa, 236-0001, Japan
(*correspondence: akinorii@jamstec.go.jp)
[2] Utrecht University, Netherlands
[3] University of Crete, Greece
[4] Cornell University, USA
[5] University of East Anglia, United Kingdom
[6] Physical Research Laboratory, India
[7] Stockholm University, Sweden
[8] Rutgers University, USA
[9] Florida State University, USA
[10] University of Georgia, USA
[11] University of Tasmania, Australia
[12] North Carolina State University, USA
[13] NASA Ames Research Center, USA
[14] Argonne National Laboratory, USA
[15] Texas A&M University, USA

Atmospheric deposition of nutrients modulates primary marine productivity and thus indirectly affects the climate. Significant progress has been made in our understanding of atmospheric inputs of nutrients from natural and anthropogenic sources to the oceans. However, there are still large uncertainties regarding the relative importance of different sources of Fe (natural vs. anthropogenic) and effects of atmospheric processing on the bioavailability of the delivered Fe.

This paper focuses on comparisons of Fe solubility between atmospheric chemistry transport models and field measurements. Results will be presented for the Atlantic, Pacific, Indian, Southern, and Arctic Oceans. We discuss Fe solubility observed in aerosols and rain water under polluted and pristine atmospheric conditions in order to assess future impacts of changes in atmospheric acidity on labile Fe inputs to the oceans and their environmental consequences. Atmospheric observations showed that Fe in aerosols and rain water can have a wide range of fractional solubility over open oceans. Global models suggest that the interactions of aerosol particles with atmospheric acids play a significant role on increasing the Fe solubility over polluted regions.