

Iron (II) oxidation kinetics variability in the Atlantic Ocean and development of an improved theoretical equation

DAVID GONZÁLEZ-SANTANA¹, MELCHOR GONZALEZ-
DAVILA², MAEVE LOHAN³, LISE ARTIGUE⁴, HÉLÈNE
PLANQUETTE⁵, GERALDINE SARTHOU⁵, ALESSANDRO
TAGLIABUE⁶ AND PROF. J. MAGDALENA SANTANA-
CASIANO⁷

¹CNRS, Univ Brest, LEMAR

²Universidad de Las Palmas de Gran Canaria

³University of Southampton

⁴LEGOS (Laboratoire d'Etudes en Géophysique et
Océanographie Spatiales)

⁵University Brest, CNRS, IRS

⁶University of Liverpool

⁷Universidad de Las Palmas de Gran Canaria (ULPGC)

Presenting Author: david.gonzalezasantana@univ-brest.fr

One of the recently recognized main sources of iron to the deep ocean inventory is the hydrothermal activity associated with mid-ocean ridges. Little is known about the oxidation kinetics of iron (II) within these environments, especially the dependence on physico-chemical parameters such as temperature (T), pH, particle size-fractionation and the effect of organic matter.

During the GEOTRACES GA13 section cruise (FRidge), the iron (II) oxidation rate constants at six hydrothermal vent sites (Menez Gwen, Lucky Strike, Rainbow, Lost City, Broken Spur and TAG) along the Mid-Atlantic Ridge were investigated, revealing high variability. Further iron (II) oxidation rate constant analysis experiments from multiple stations revealed that the presence of organic ligands and colloidal size particles delayed the oxidation process, while not affecting the overall pH dependency.

In order to extend the multiparametric equation of the iron (II) oxidation rate constants, a set of selected samples was analysed across a range of temperatures between 2 and 25 °C and of pH between 7 and 8. The new equation covers a larger range of temperatures than previous published equations and provides consistently better statistical results, thus improving its applicability for global biogeochemical models.