Distribution and speciation of copper in seawater of East China Sea and its surrounding areas

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Introduction

Copper is an essential micronutrient for all marine living organisms [1], but Cu^{2+} can be toxic at high concentrations in seawater [2]. Therefore, it is reported that many phytoplankton and bacterial species have the ability to release Cu-complexing ligands to decrease the concentration of free Cu^{2+} and reduce its toxicity. In eutrophic surface waters, more than 99.9% of Cu is complexed with organic ligands [3]. However, the sources of these ligands have not been fully identified. In this study, we determined the total dissolved Cu concentrations, Cu speciation parameters and free Cu concentrations at 12 stations in the East China Sea and its surrounding areas using cathodic stripping voltammetry (CSV) [4][5].

Results and Discussion

The highest concentration of total dissolved Cu found at the study area was 4.7 nM and the lowest concentration was 0.47 nM. Surface waters at three stations were found to have relatively high Cu concentrations and low salinities, which can be attributed to the Yangtze River discharge. The Yangtze River is thought to be a major source of Cu into the East China Sea [6][7]. Two classes of ligands were found in the surface waters in this study. The concentration of the stronger ligand, L_1, ranged from 1.1 nM to 7.5 nM, with an average conditional stability constant (log K) of around 14, whereas for the weaker ligand, L_2, the concentrations were in the range of 11 nM to 27 nM, with an average log K value of around 12.3. Free Cu (Cu^{2+}) concentrations remain constant at all stations (~10^{-14} M). The large ligand pool had probably helped buffer against changes in Cu concentration in seawater of the East China Sea.

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